Logiweb codex of base

Up Help

base, $[* \bowtie *]$, “ ∗ ”, , ∗ then ∗, ∗[∗]∗, **Preassociative** ∗; ∗, **Postassociative** ∗; ∗, [∗], ∗, priority ∗ end, ∗, ∗, $(*)^{\mathbf{t}}$, string(∗) + ∗, string(∗) ++ ∗, bracket ∗ end bracket, big bracket ∗ end bracket, math ∗ end math, **flush left** [∗], x, y, z, $[* \xrightarrow{*} *]$, pyk, tex, name, prio, T, if(∗, ∗, ∗), $[* \overset{*}{\Rightarrow} *]$, val, claim, ∗, !∗, ”∗, #∗, $∗, %∗, &∗, ’∗, (∗,)∗, ∗∗, +∗, ,∗, -∗, .∗, /∗, 0∗, 1∗, 2∗, 3∗, 4∗, 5∗, 6∗, 7∗, 8∗, 9∗, :∗, ;∗, <∗, =∗, >∗, ?∗, @∗, A∗, B∗, C∗, D∗, E∗, F∗, G∗, H∗, I∗, J∗, K∗, L∗, M∗, N∗, O∗, P∗, Q∗, R∗, S∗, T∗, U∗, V∗, W∗, X∗, Y∗, Z∗, [∗, \∗,]∗, ˆ∗, _∗, ‘∗, a∗, b∗, c∗, d∗, e∗, f∗, g∗, h∗, i∗, j∗, k∗, l∗, m∗, n∗, o∗, p∗, q∗, r∗, s∗, t∗, u∗, v∗, w∗, x∗, y∗, z∗, {∗, |∗, }∗, ˜∗, ⊥, f(∗), $(*)^{\mathrm{I}}$, F, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, $(*)^{\mathrm{M}}$, If(∗, ∗, ∗), array{∗} ∗ end array, l, c, r, empty, $\langle * \mid * := * \rangle$, $\mathcal{M}(*)$, $\tilde{\mathcal{U}}(*)$, $\mathcal{U}(*)$, $\mathcal{U}^{\mathrm{M}}(*)$, **apply**(∗, ∗), $\mathbf{apply}_1(*,*)$, identifier(∗), $\mathrm{identifier}_1(*,*)$, array-plus(∗, ∗), array-remove(∗, ∗, ∗), array-put(∗, ∗, ∗, ∗), array-add(∗, ∗, ∗, ∗, ∗), bit(∗, ∗), $\mathrm{bit}_1(*,*)$, rack, "vector", "bibliography", "dictionary", "body", "codex", "expansion", "code", "cache", "diagnose", "pyk", "tex", "texname", "value", "message", "macro", "definition", "unpack", "claim", "priority", "lambda", "apply", "true", "if", "quote", "proclaim", "define", "introduce", "hide", "pre", "post", $\mathcal{E}(*,*,*)$, $\mathcal{E}_2(*,*,*,*,*)$, $\mathcal{E}_3(*,*,*,*)$, $\mathcal{E}_4(*,*,*,*)$, **lookup**(∗, ∗, ∗), **abstract**(∗, ∗, ∗, ∗), $\lceil * \rceil$, $\mathcal{M}(*,*,*)$, $\mathcal{M}_2(*,*,*,*)$, $\mathcal{M}^*(*,*,*)$, macro, s_0, **zip**(∗, ∗), $\mathbf{assoc}_1(*,*,*)$, $(*)^{\mathbf{P}}$, self, $[* \doteq *]$, $[* \doteq *]$, $[* \doteq *]$, $[* \overset{\mathrm{pyk}}{=} *]$, $[* \overset{\mathrm{tex}}{=} *]$, $[* \overset{\mathrm{name}}{=} *]$, **Priority table**[∗], $\tilde{\mathcal{M}}_1$, $\tilde{\mathcal{M}}_2(*)$, $\tilde{\mathcal{M}}_3(*)$, $\tilde{\mathcal{M}}_4(*,*,*,*)$, $\tilde{\mathcal{M}}(*,*,*)$, $\tilde{\mathcal{Q}}(*,*,*)$, $\tilde{\mathcal{Q}}_2(*,*,*)$, $\tilde{\mathcal{Q}}_3(*,*,*,*)$, $\tilde{\mathcal{Q}}^*(*,*,*)$, (∗), **aspect**(∗, ∗), **aspect**(∗, ∗, ∗), ⟨∗⟩, $\mathbf{tuple}_1(*)$, $\mathbf{tuple}_2(*)$, $\mathrm{let}_2(*,*)$, $\mathrm{let}_1(*,*)$, $[* \overset{\mathrm{claim}}{=} *]$, checker, **check**(∗, ∗), $\mathbf{check}_2(*,*,*)$, $\mathbf{check}_3(*,*,*)$, $\mathbf{check}^*(*,*)$, $\mathbf{check}^*_2(*,*,*)$, $[*]^{\cdot}$, $[*]^{-}$, $[*]^{\circ}$, msg, $[* \overset{\mathrm{msg}}{=} *]$, <stmt>, stmt, $[* \overset{\mathrm{stmt}}{=} *]$, HeadNil′, HeadPair′, Transitivity′, ⫫, Contra′, T'_{E}, L_1, $\underline{*}$, $\mathcal{A}$, $\mathcal{B}$, $\mathcal{C}$, $\mathcal{D}$, $\mathcal{E}$, $\mathcal{F}$, $\mathcal{G}$, $\mathcal{H}$, $\mathcal{I}$, $\mathcal{J}$, $\mathcal{K}$, $\mathcal{L}$, $\mathcal{M}$, $\mathcal{N}$, $\mathcal{O}$, $\mathcal{P}$, $\mathcal{Q}$, $\mathcal{R}$, $\mathcal{S}$, $\mathcal{T}$, $\mathcal{U}$, $\mathcal{V}$, $\mathcal{W}$, $\mathcal{X}$, $\mathcal{Y}$, $\mathcal{Z}$, $\langle * \mid * := * \rangle$, $\langle {}^{*} * \mid * := * \rangle$, $\emptyset$, Remainder, $(*)^{\mathbf{v}}$, intro(∗, ∗, ∗, ∗), intro(∗, ∗, ∗), error(∗, ∗), $\mathrm{error}_2(*,*)$, proof(∗, ∗, ∗), $\mathrm{proof}_2(*,*)$, $\mathcal{S}(*,*)$, $\mathcal{S}^{\mathrm{I}}(*,*)$, $\mathcal{S}^{\triangleright}(*,*)$, $\mathcal{S}^{\triangleright}_1(*,*,*)$, $\mathcal{S}^{\mathrm{E}}(*,*)$, $\mathcal{S}^{\mathrm{E}}_1(*,*,*)$, $\mathcal{S}^{+}(*,*)$, $\mathcal{S}^{+}_1(*,*,*)$, $\mathcal{S}^{-}(*,*)$, $\mathcal{S}^{-}_1(*,*,*)$, $\mathcal{S}^{*}(*,*)$, $\mathcal{S}^{*}_1(*,*,*)$, $\mathcal{S}^{*}_2(*,*,*,*)$, $\mathcal{S}^{@}(*,*)$, $\mathcal{S}^{@}_1(*,*,*)$, $\mathcal{S}^{\vdash}(*,*)$, $\mathcal{S}^{\vdash}_1(*,*,*,*)$, $\mathcal{S}^{\Vdash}(*,*)$, $\mathcal{S}^{\Vdash}_1(*,*,*,*)$, $\mathcal{S}^{\mathrm{i.e.}}(*,*)$, $\mathcal{S}^{\mathrm{i.e.}}_1(*,*,*,*)$, $\mathcal{S}^{\mathrm{i.e.}}_2(*,*,*,*,*,*)$, $\mathcal{S}^{\forall}(*,*)$, $\mathcal{S}^{\forall}_1(*,*,*,*)$, $\mathcal{S}^{\cdot}(*,*)$, $\mathcal{S}^{\cdot}_1(*,*,*)$, $\mathcal{S}^{\cdot}_2(*,*,*,*)$, $\mathcal{T}(*)$, claims(∗, ∗, ∗), $\mathrm{claims}_2(*,*,*)$, <proof>, proof, [**Lemma** ∗: ∗], [**Proof of** ∗: ∗], [∗ **lemma** ∗: ∗], [∗ **antilemma** ∗: ∗], [∗ **rule** ∗: ∗], [∗ **antirule** ∗: ∗], verifier, $\mathcal{V}_1(*)$, $\mathcal{V}_2(*,*)$, $\mathcal{V}_3(*,*,*,*)$, $\mathcal{V}_4(*,*)$, $\mathcal{V}_5(*,*,*,*)$, $\mathcal{V}_6(*,*,*,*)$, $\mathcal{V}_7(*,*,*,*)$, Cut(∗, ∗), $\mathrm{Head}_{\oplus}(*)$, $\mathrm{Tail}_{\oplus}(*)$, $\mathrm{rule}_1(*,*)$, rule(∗, ∗), Rule tactic, Plus(∗, ∗), [**Theory** ∗],

$\mathrm{theory}_2(*,*)$, $\mathrm{theory}_3(*,*)$, $\mathrm{theory}_4(*,*,*)$, HeadNil″, HeadPair″, Transitivity″, Contra″, HeadNil, HeadPair, Transitivity, Contra, $\mathrm{T_E}$, ragged right, ragged right expansion , $\mathrm{parm}(*,*,*)$, $\mathrm{parm}^*(*,*,*)$, $\mathrm{inst}(*,*)$, $\mathrm{inst}^*(*,*)$, $\mathrm{occur}(*,*,*)$, $\mathrm{occur}^*(*,*,*)$, $\mathrm{unify}(*=*,*)$, $\mathrm{unify}^*(*=*,*)$, $\mathrm{unify}_2(*=*,*)$, $\mathrm{L_a}$, $\mathrm{L_b}$, $\mathrm{L_c}$, $\mathrm{L_d}$, $\mathrm{L_e}$, $\mathrm{L_f}$, $\mathrm{L_g}$, $\mathrm{L_h}$, $\mathrm{L_i}$, $\mathrm{L_j}$, $\mathrm{L_k}$, $\mathrm{L_l}$, $\mathrm{L_m}$, $\mathrm{L_n}$, $\mathrm{L_o}$, $\mathrm{L_p}$, $\mathrm{L_q}$, $\mathrm{L_r}$, $\mathrm{L_s}$, $\mathrm{L_t}$, $\mathrm{L_u}$, $\mathrm{L_v}$, $\mathrm{L_w}$, $\mathrm{L_x}$, $\mathrm{L_y}$, $\mathrm{L_z}$, $\mathrm{L_A}$, $\mathrm{L_B}$, $\mathrm{L_C}$, $\mathrm{L_D}$, $\mathrm{L_E}$, $\mathrm{L_F}$, $\mathrm{L_G}$, $\mathrm{L_H}$, $\mathrm{L_I}$, $\mathrm{L_J}$, $\mathrm{L_K}$, $\mathrm{L_L}$, $\mathrm{L_M}$, $\mathrm{L_N}$, $\mathrm{L_O}$, $\mathrm{L_P}$, $\mathrm{L_Q}$, $\mathrm{L_R}$, $\mathrm{L_S}$, $\mathrm{L_T}$, $\mathrm{L_U}$, $\mathrm{L_V}$, $\mathrm{L_W}$, $\mathrm{L_X}$, $\mathrm{L_Y}$, $\mathrm{L_Z}$, $\mathrm{L_?}$, Reflexivity, $\mathrm{Reflexivity}_1$, Commutativity, $\mathrm{Commutativity}_1$, <tactic>, tactic, $[* \overset{\text{tactic}}{=} *]$, $\mathcal{P}(*,*,*)$, $\mathcal{P}^*(*,*,*)$, $\mathrm{p_0}$, $\mathrm{conclude}_1(*,*)$, $\mathrm{conclude}_2(*,*,*)$, $\mathrm{conclude}_3(*,*,*,*)$, $*\_\{*\}$, $*'$, $*[*]$, $*[*\rightarrow*]$, $*[*\Rightarrow*]$, newline $*$, macro newline $*$, $*0$, $*1$, 0b, $*$-color$(*)$, $*$-color$^*(*)$, $*\,'*$, $*\,`*$, $*^{\mathrm{H}}$, $*^{\mathrm{T}}$, $*^{\mathrm{U}}$, $*^{\mathrm{h}}$, $*^{\mathrm{t}}$, $*^{\mathrm{s}}$, $*^{\mathrm{c}}$, $*^{\mathrm{d}}$, $*^{\mathrm{a}}$, $*^{\mathrm{C}}$, $*^{\mathrm{M}}$, $*^{\mathrm{B}}$, $*^{\mathrm{r}}$, $*^{\mathrm{i}}$, $*^{\mathrm{d}}$, $*^{\mathrm{R}}$, $*^0$, $*^1$, $*^2$, $*^3$, $*^4$, $*^5$, $*^6$, $*^7$, $*^8$, $*^9$, $*^{\mathrm{E}}$, $*^{\mathcal{V}}$, $*^{\mathcal{C}}$, $*^{\mathcal{C}^*}$, $*\cdot*$, $*\,{}_0*$, $*+*$, $*+_0*$, $*+_1*$, $*-*$, $*-_0*$, $*-_1*$, $*\cup\{*\}$, $*\cup*$, $*\backslash\{*\}$, $*\,\therefore*$, $*\,\underline{\therefore}*$, $*\,\underline{::}*$, $*\,\underline{+2*}*$, $*::*$, $*+2**$, $*,*,*$, $*\overset{\mathrm{B}}{\approx}*$, $*\overset{\mathrm{D}}{\approx}*$, $*\overset{\mathrm{C}}{\approx}*$, $*\overset{\mathrm{P}}{\approx}*$, $*\approx*$, $*=*$, $*\overset{+}{\rightarrow}*$, $*\overset{\mathrm{t}}{=}*$, $*\overset{\mathrm{t}^*}{=}*$, $*\overset{\mathrm{r}}{=}*$, $*\in_{\mathrm{t}}*$, $*\subseteq_{\mathrm{T}}*$, $*\overset{\mathrm{T}}{=}*$, $*\overset{\mathrm{s}}{=}*$, $*$ free in $*$, $*$ free in* $*$, $*$ free for $*$ in $*$, $*$ free for* $*$ in $*$, $*\in_{\mathrm{c}}*$, $*<*$, $*<'*$, $*\leq'*$, $\neg*$, $*\wedge*$, $*\ddot{\wedge}*$, $*\tilde{\wedge}*$, $*\wedge_{\mathrm{c}}*$, $*\vee*$, $*\parallel*$, $*\ddot{\vee}*$, $*\Rrightarrow*$, $*:*$, $*!*$, $*\begin{cases}*\\*\end{cases}$, $\lambda*.*$, $\Lambda*$, **if** $*$ **then** $*$ **else** $*$, **let** $*=*$ **in** $*$, **let** $*\ddot{=}*$ in $*$, $*^{\mathrm{I}}$, $*^{\triangleright}$, $*^{\mathrm{V}}$, $*^{+}$, $*^{-}$, $*^{*}$, $*\,@*$, $*\triangleright*$, $*\blacktriangleright*$, $*\gg*$, $*\vdash*$, $*\nvdash*$, $*$ i.e. $*$, $\forall*:*$, $*\oplus*$, $*;*$, $*$ proves $*$, $*$ **proof of** $*:*$, Line $*:*\gg*;*$, Last line $*\gg*\,\square$, Line $*:$ Premise $\gg*;*$, Line $*:$ Side-condition $\gg*;*$, Arbitrary $\gg*;*$, Local $\gg**=*;*$, $*\&*$, $*\backslash\backslash*$,

base

[base $\overset{\text{prio}}{\rightarrow}$

Preassociative

[base], [bracket $*$ end bracket], [big bracket $*$ end bracket], [math $*$ end math], [**flush left** $[*]$], [x], [y], [z], $[[*\bowtie*]]$, $[[*\overset{*}{\rightarrow}*]]$, [pyk], [tex], [name], [prio], $[*]$, [T], $[\mathrm{if}(*,*,*)]$, $[[*\overset{*}{\Rightarrow}*]]$, [val], [claim], $[\bot]$, $[\mathrm{f}(*)]$, $[(*)^{\mathrm{I}}]$, [F], [0], [1], [2], [3], [4], [5], [6], [7], [8], [9], [0], [1], [2], [3], [4], [5], [6], [7], [8], [9], [a], [b], [c], [d], [e], [f], [g], [h], [i], [j], [k], [l], [m], [n], [o], [p], [q], [r], [s], [t], [u], [v], [w], $[(*)^{\mathrm{M}}]$, $[\mathrm{If}(*,*,*)]$, [array$\{*\}$ $*$ end array], [l], [c], [r], [empty], $[\langle * \mid * := * \rangle]$, $[\mathcal{M}(*)]$, $[\tilde{\mathcal{U}}(*)]$, $[\mathcal{U}(*)]$, $[\mathcal{U}^{\mathrm{M}}(*)]$, $[\mathbf{apply}(*,*)]$, $[\mathbf{apply}_1(*,*)]$, [identifier$(*)$], [identifier$_1(*,*)$], [array-plus$(*,*)$], [array-remove$(*,*,*)$], [array-put$(*,*,*,*)$], [array-add$(*,*,*,*,*)$], [bit$(*,*)$], [bit$_1(*,*)$], [rack], ["vector"], ["bibliography"], ["dictionary"], ["body"], ["codex"], ["expansion"], ["code"], ["cache"], ["diagnose"], ["pyk"], ["tex"], ["texname"], ["value"], ["message"], ["macro"], ["definition"], ["unpack"], ["claim"], ["priority"], ["lambda"], ["apply"], ["true"], ["if"], ["quote"], ["proclaim"], ["define"], ["introduce"], ["hide"], ["pre"], ["post"], $[\mathcal{E}(*,*,*)]$, $[\mathcal{E}_2(*,*,*,*,*)]$, $[\mathcal{E}_3(*,*,*,*)]$, $[\mathcal{E}_4(*,*,*,*)]$, $[\mathbf{lookup}(*,*,*)]$, $[\mathbf{abstract}(*,*,*,*)]$, $[\lceil * \rceil]$, $[\mathcal{M}(*,*,*)]$, $[\mathcal{M}_2(*,*,*,*)]$, $[\mathcal{M}^*(*,*,*)]$, [macro],

[s_0], [**zip**$(*,*)$], [**assoc**$_1(*,*,*)$], [$(*)^{\mathbf{p}}$], [self], [$[* \doteq *]$], [$[* \doteq *]$], [$[* \doteq *]$],
[$[* \overset{\text{pyk}}{=} *]$], [$[* \overset{\text{tex}}{=} *]$], [$[* \overset{\text{name}}{=} *]$], [**Priority table**$[*]$], [$\tilde{\mathcal{M}}_1$], [$\tilde{\mathcal{M}}_2(*)$], [$\tilde{\mathcal{M}}_3(*)$],
[$\tilde{\mathcal{M}}_4(*,*,*,*)$], [$\tilde{\mathcal{M}}(*,*,*)$], [$\tilde{\mathcal{Q}}(*,*,*)$], [$\tilde{\mathcal{Q}}_2(*,*,*)$], [$\tilde{\mathcal{Q}}_3(*,*,*,*)$], [$\tilde{\mathcal{Q}}^*(*,*,*)$],
$[(*)]$, [**aspect**$(*,*)$], [**aspect**$(*,*,*)$], [$\langle * \rangle$], [**tuple**$_1(*)$], [**tuple**$_2(*)$], [let$_2(*,*)$],
[let$_1(*,*)$], [$[* \overset{\text{claim}}{=} *]$], [checker], [**check**$(*,*)$], [**check**$_2(*,*,*)$], [**check**$_3(*,*,*)$],
[**check**$^*(*,*)$], [**check**$^*_2(*,*,*)$], [$[*]^{\cdot}$], [$[*]^{-}$], [$[*]^{\circ}$], [msg], [$[* \overset{\text{msg}}{=} *]$], [<stmt>],
[stmt], [$[* \overset{\text{stmt}}{=} *]$], [HeadNil$'$], [HeadPair$'$], [Transitivity$'$], [$\perp\!\!\!\perp$], [Contra$'$], [$\mathrm{T}'_{\mathrm{E}}$],
[L_1], [$\underline{*}$], [$\mathcal{A}$], [$\mathcal{B}$], [$\mathcal{C}$], [$\mathcal{D}$], [$\mathcal{E}$], [$\mathcal{F}$], [$\mathcal{G}$], [$\mathcal{H}$], [$\mathcal{I}$], [$\mathcal{J}$], [$\mathcal{K}$], [$\mathcal{L}$], [$\mathcal{M}$], [$\mathcal{N}$], [$\mathcal{O}$], [$\mathcal{P}$], [$\mathcal{Q}$],
[$\mathcal{R}$], [$\mathcal{S}$], [$\mathcal{T}$], [$\mathcal{U}$], [$\mathcal{V}$], [$\mathcal{W}$], [$\mathcal{X}$], [$\mathcal{Y}$], [$\mathcal{Z}$], [$\langle * \mid * := * \rangle$], [$\langle {}^* * \mid * := * \rangle$], [$\emptyset$], [Remainder],
$[(*)^{\mathbf{v}}]$, [intro$(*,*,*)$], [intro$(*,*)$], [error$(*,*)$], [error$_2(*,*)$], [proof$(*,*,*)$],
[proof$_2(*,*)$], [$\mathcal{S}(*,*)$], [$\mathcal{S}^{\mathrm{I}}(*,*)$], [$\mathcal{S}^{\triangleright}(*,*)$], [$\mathcal{S}^{\triangleright}_1(*,*,*)$], [$\mathcal{S}^{\mathrm{E}}(*,*)$], [$\mathcal{S}^{\mathrm{E}}_1(*,*,*)$],
[$\mathcal{S}^{+}(*,*)$], [$\mathcal{S}^{+}_1(*,*,*)$], [$\mathcal{S}^{-}(*,*)$], [$\mathcal{S}^{-}_1(*,*,*)$], [$\mathcal{S}^{*}(*,*)$], [$\mathcal{S}^{*}_1(*,*,*)$],
[$\mathcal{S}^{*}_2(*,*,*,*)$], [$\mathcal{S}^{@}(*,*)$], [$\mathcal{S}^{@}_1(*,*,*)$], [$\mathcal{S}^{\vdash}(*,*)$], [$\mathcal{S}^{\vdash}_1(*,*,*,*)$], [$\mathcal{S}^{\Vdash}(*,*)$],
[$\mathcal{S}^{\Vdash}_1(*,*,*,*)$], [$\mathcal{S}^{\mathrm{i.e.}}(*,*)$], [$\mathcal{S}^{\mathrm{i.e.}}_1(*,*,*,*)$], [$\mathcal{S}^{\mathrm{i.e.}}_2(*,*,*,*,*)$], [$\mathcal{S}^{\forall}(*,*)$],
[$\mathcal{S}^{\forall}_1(*,*,*,*)$], [$\mathcal{S}^{;}(*,*)$], [$\mathcal{S}^{;}_1(*,*,*)$], [$\mathcal{S}^{;}_2(*,*,*,*)$], [$\mathcal{T}(*)$], [claims$(*,*,*)$],
[claims$_2(*,*,*)$], [<proof>], [proof], [[**Lemma** $*$: $*$]], [[**Proof of** $*$: $*$]],
[[$*$ **lemma** $*$: $*$]], [[$*$ **antilemma** $*$: $*$]], [[$*$ **rule** $*$: $*$]], [[$*$ **antirule** $*$: $*$]],
[verifier], [$\mathcal{V}_1(*)$], [$\mathcal{V}_2(*,*)$], [$\mathcal{V}_3(*,*,*,*)$], [$\mathcal{V}_4(*,*)$], [$\mathcal{V}_5(*,*,*,*)$], [$\mathcal{V}_6(*,*,*,*)$],
[$\mathcal{V}_7(*,*,*,*)$], [Cut$(*,*)$], [Head$_{\oplus}(*)$], [Tail$_{\oplus}(*)$], [rule$_1(*,*)$], [rule$(*,*)$],
[Rule tactic], [Plus$(*,*)$], [[**Theory** $*$]], [theory$_2(*,*)$], [theory$_3(*,*)$],
[theory$_4(*,*,*)$], [HeadNil$''$], [HeadPair$''$], [Transitivity$''$], [Contra$''$], [HeadNil],
[HeadPair], [Transitivity], [Contra], [T_{E}], [ragged right],
[ragged right expansion], [parm$(*,*,*)$], [parm$^*(*,*,*)$], [inst$(*,*)$],
[inst$^*(*,*)$], [occur$(*,*,*)$], [occur$^*(*,*,*)$], [unify$(* = *,*)$], [unify$^*(* = *,*)$],
[unify$_2(* = *,*)$], [L_{a}], [L_{b}], [L_{c}], [L_{d}], [L_{e}], [L_{f}], [L_{g}], [L_{h}], [L_{i}], [L_{j}], [L_{k}], [L_{l}], [L_{m}],
[L_{n}], [L_{o}], [L_{p}], [L_{q}], [L_{r}], [L_{s}], [L_{t}], [L_{u}], [L_{v}], [L_{w}], [L_{x}], [L_{y}], [L_{z}], [L_{A}], [L_{B}], [L_{C}],
[L_{D}], [L_{E}], [L_{F}], [L_{G}], [L_{H}], [L_{I}], [L_{J}], [L_{K}], [L_{L}], [L_{M}], [L_{N}], [L_{O}], [L_{P}], [L_{Q}], [L_{R}],
[L_{S}], [L_{T}], [L_{U}], [L_{V}], [L_{W}], [L_{X}], [L_{Y}], [L_{Z}], [$\mathrm{L}_{?}$], [Reflexivity], [Reflexivity$_1$],
[Commutativity], [Commutativity$_1$], [<tactic>], [tactic], [$[* \overset{\text{tactic}}{=} *]$], [$\mathcal{P}(*,*,*)$],
[$\mathcal{P}^*(*,*,*)$], [p_0], [conclude$_1(*,*)$], [conclude$_2(*,*,*)$], [conclude$_3(*,*,*,*)$];

Preassociative

[$*$_{$*$}], [$*'$], [$*[\,*\,]$], [$*[* \to *]$], [$*[* \Rightarrow *]$];

Preassociative

[“ $*$ ”], [], $[(*)^{\mathbf{t}}]$, [string$(*)$ + $*$], [string$(*)$ ++ $*$], [
$*$], [$*$], [!$*$], [”$*$], [#$*$], [\$$*$], [%$*$], [&$*$], [’$*$], [($*$),)$*$], [**), [+$*$], [, $*$], [-$*$], [.$*$], [/$*$],
[0$*$], [1$*$], [2$*$], [3$*$], [4$*$], [5$*$], [6$*$], [7$*$], [8$*$], [9$*$], [:$*$], [; $*$], [<$*$], [=$*$], [>$*$], [?$*$],
[@$*$], [A$*$], [B$*$], [C$*$], [D$*$], [E$*$], [F$*$], [G$*$], [H$*$], [I$*$], [J$*$], [K$*$], [L$*$], [M$*$], [N$*$],
[O$*$], [P$*$], [Q$*$], [R$*$], [S$*$], [T$*$], [U$*$], [V$*$], [W$*$], [X$*$], [Y$*$], [Z$*$], [[$*$], [\$*$], []$*$], [ˆ$*$],
[_$*$], [‘$*$], [a$*$], [b$*$], [c$*$], [d$*$], [e$*$], [f$*$], [g$*$], [h$*$], [i$*$], [j$*$], [k$*$], [l$*$], [m$*$], [n$*$], [o$*$],
[p$*$], [q$*$], [r$*$], [s$*$], [t$*$], [u$*$], [v$*$], [w$*$], [x$*$], [y$*$], [z$*$], [{$*$}, [|$*$], [}$*$], [˜$*$],
[**Preassociative** $*$; $*$], [**Postassociative** $*$; $*$], [[$*$], $*$], [priority $*$ end],
[newline $*$], [macro newline $*$];

Preassociative

[$*0$], [$*1$], [0b], [$*$-color$(*)$], [$*$-color$^*(*)$];

Preassociative
$[* \text{ '} *], [* \text{ `} *];$
Preassociative
$[*^{\mathrm{H}}], [*^{\mathrm{T}}], [*^{\mathrm{U}}], [*^{\mathrm{h}}], [*^{\mathrm{t}}], [*^{\mathrm{s}}], [*^{\mathrm{c}}], [*^{\mathrm{d}}], [*^{\mathrm{a}}], [*^{\mathrm{C}}], [*^{\mathrm{M}}], [*^{\mathrm{B}}], [*^{\mathrm{r}}], [*^{\mathrm{i}}], [*^{\mathrm{d}}], [*^{\mathrm{R}}], [*^{0}],$
$[*^{1}], [*^{2}], [*^{3}], [*^{4}], [*^{5}], [*^{6}], [*^{7}], [*^{8}], [*^{9}], [*^{\mathrm{E}}], [*^{\mathcal{V}}], [*^{\mathcal{C}}], [*^{\mathcal{C}^*}];$
Preassociative
$[* \cdot *], [* \cdot_0 *];$
Preassociative
$[* + *], [* +_0 *], [* +_1 *], [* - *], [* -_0 *], [* -_1 *];$
Preassociative
$[* \cup \{*\}], [* \cup *], [* \backslash \{*\}];$
Postassociative
$[* \mathbin{\therefore} *], [* \underline{\mathbin{\therefore}} *], [* \underline{::} *], [* \underline{+2*} *], [* :: *], [* +2* *];$
Postassociative
$[*, *];$
Preassociative
$[* \overset{\mathrm{B}}{\approx} *], [* \overset{\mathrm{D}}{\approx} *], [* \overset{\mathrm{C}}{\approx} *], [* \overset{\mathrm{P}}{\approx} *], [* \approx *], [* = *], [* \overset{+}{\to} *], [* \overset{\mathrm{t}}{=} *], [* \overset{\mathrm{t}^*}{=} *], [* \overset{\mathrm{r}}{=} *],$
$[* \in_{\mathrm{t}} *], [* \subseteq_{\mathrm{T}} *], [* \overset{\mathrm{T}}{=} *], [* \overset{\mathrm{s}}{=} *], [* \text{ free in } *], [* \text{ free in}^* *], [* \text{ free for } * \text{ in } *],$
$[* \text{ free for}^* * \text{ in } *], [* \in_{\mathrm{c}} *], [* < *], [* <' *], [* \leq' *];$
Preassociative
$[\neg *];$
Preassociative
$[* \wedge *], [* \ddot{\wedge} *], [* \tilde{\wedge} *], [* \wedge_{\mathrm{c}} *];$
Preassociative
$[* \vee *], [* \parallel *], [* \ddot{\vee} *];$
Postassociative
$[* \Rrightarrow *];$
Postassociative
$[* : *], [*!*];$
Preassociative
$[* \begin{cases} * \\ * \end{cases}];$
Preassociative
$[\lambda * .*], [\Lambda *], [\textbf{if } * \textbf{ then } * \textbf{ else } *], [\textbf{let } * = * \textbf{ in } *], [\textbf{let } * \ddot{=} * \text{ in } *];$
Preassociative
$[*^{\mathrm{I}}], [*^{\triangleright}], [*^{\mathrm{V}}], [*^{+}], [*^{-}], [*^{*}];$
Preassociative
$[* @ *], [* \triangleright *], [* \blacktriangleright *], [* \gg *];$
Postassociative
$[* \vdash *], [* \Vdash *], [* \text{ i.e. } *];$
Preassociative
$[\forall *: *];$
Postassociative
$[* \oplus *];$
Postassociative

$[*;*]$;
Preassociative
$[*$ proves $*]$;
Preassociative
$[*$ **proof of** $* : *]$, $[\text{Line} * : * \gg *; *]$, $[\text{Last line} * \gg * \Box]$,
$[\text{Line} * : \text{Premise} \gg *; *]$, $[\text{Line} * : \text{Side-condition} \gg *; *]$, $[\text{Arbitrary} \gg *; *]$,
$[\text{Local} \gg * = *; *]$;
Postassociative
$[*$ then $*]$, $[*[\ *\ ]*]$;
Preassociative
$[*\&*]$;
Preassociative
$[*\backslash\backslash *];]$

$[\text{base} \overset{\text{macro}}{\rightarrow} \lambda \mathsf{t}.\lambda \mathsf{c}.\mathcal{M}(\mathsf{t}, \mathrm{s}_0, \mathsf{c})]$

$[\text{base} \overset{\text{claim}}{\rightarrow} \text{checker} \wedge_{\mathrm{c}} \text{verifier}]$

$[\text{base} \overset{\text{pyk}}{\rightarrow} \text{“base”}]$

$\left[* \bowtie *\right]$

Predef: proclaim

$[[\mathsf{x} \bowtie \mathsf{y}] \overset{\text{tex}}{\rightarrow}$ “
[#1/tex name/tex.
\bowtie#2.
]”]

$[[\mathsf{x} \bowtie \mathsf{y}] \overset{\text{pyk}}{\rightarrow} \text{“proclaim} * \text{as} * \text{end proclaim”}]$

“ $*$ ”

Predef: hide
[“x” $\overset{\text{name}}{\rightarrow}$ “
\mbox{“}#1.
\mbox{”}”]

[“x” $\overset{\text{macro}}{\rightarrow} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\mathsf{t}$]

[“x” $\overset{\text{tex}}{\rightarrow}$ “#1.”]

[“x” $\overset{\text{pyk}}{\rightarrow}$ “unicode start of text $*$ end unicode text”]

[$\overset{\text{tex}}{\to}$ “”]

[$\overset{\text{pyk}}{\to}$ “unicode end of text”]

∗ then ∗

[x then y $\overset{\text{name}}{\to}$ “#1.
\mathrel{\mathrm{then}}#2.”]

[x then y $\overset{\text{val}}{\to}$ ⌈∗∗⌉$^{\text{R}}$ :: [x :: [y :: T]]]

[x then y $\overset{\text{tex}}{\to}$ “#1.#2.”]

[x then y $\overset{\text{pyk}}{\to}$ “∗

then ∗”]

∗[∗]∗

[x[y]z $\overset{\text{name}}{\to}$ “#1.
{[}#2.
{]}#3.”]

[x[y]z $\overset{\text{tex}}{\to}$ “#1.#2.#3.”]

[x[y]z $\overset{\text{pyk}}{\to}$ “∗

begin ∗

end ∗”]

Preassociative ∗; ∗

Predef: pre

[**Preassociative** x; y $\overset{\text{name}}{\to}$ “
\mathbf{Preassociative}\,#1.
; #2.”]

[**Preassociative** x; y $\overset{\text{tex}}{\to}$ “
\newline \mathbf {Preassociative} \newline #1.
; #2.”]

[**Preassociative** x; y $\overset{\text{pyk}}{\rightarrow}$ “preassociative $*$ greater than $*$”]

Postassociative $*; *$

Predef: post

[**Postassociative** x; y $\overset{\text{name}}{\rightarrow}$ “
\mathbf{Postassociative}\, #1.
; #2.”]

[**Postassociative** x; y $\overset{\text{tex}}{\rightarrow}$ “
\newline\mathbf{Postassociative} \newline #1.
; #2.”]

[**Postassociative** x; y $\overset{\text{pyk}}{\rightarrow}$ “postassociative $*$ greater than $*$”]

$\left[*\right], *$

[[x], y $\overset{\text{name}}{\rightarrow}$ “
[#1.
] , \linebreak [0] #2.”]

[[x], y $\overset{\text{tex}}{\rightarrow}$ “
[#1/tex name/tex.
] , \linebreak [0] #2.”]

[[x], y $\overset{\text{pyk}}{\rightarrow}$ “priority $*$ equal $*$”]

priority $*$ end

[priority x end $\overset{\text{name}}{\rightarrow}$ “
\mathrm{priority} \, #1.
\, \mathrm{end}”]

[priority x end $\overset{\text{tex}}{\rightarrow}$ “
[#1/tex name/tex.
]”]

[priority x end $\overset{\text{pyk}}{\rightarrow}$ “priority $*$ end priority”]

$*$

$[$
$\mathsf{x} \overset{\text{name}}{\to}$ “
\newline #1.”$]$
$[$
$\mathsf{x} \overset{\text{tex}}{\to}$ “
#1.”$]$
$[$
$\mathsf{x} \overset{\text{pyk}}{\to}$ “
unicode newline $*$”$]$

$*$

$[* \overset{\text{tex}}{\to}$ “
\ast ”$]$
$[* \overset{\text{pyk}}{\to}$ “x”$]$

$(*)^{\mathbf{t}}$

$[(\mathsf{x})^{\mathbf{t}} \overset{\text{name}}{\to}$ “
(#1.
)^{\bf t}”$]$
$[(\mathsf{x})^{\mathbf{t}} \overset{\text{val}}{\to} \lceil * \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: \mathsf{T} \,]\,]$
$[(\mathsf{x})^{\mathbf{t}} \overset{\text{tex}}{\to}$ “#1/tex name.”$]$
$[(\mathsf{x})^{\mathbf{t}} \overset{\text{pyk}}{\to}$ “text $*$ end text”$]$

$\mathbf{string}(*) + *$

$[\mathrm{string}(\mathsf{x}) + \mathsf{y} \overset{\text{name}}{\to}$ “
\mbox{string}(#1.
)+#2.”$]$
$[\mathrm{string}(\mathsf{x}) + \mathsf{y} \overset{\text{tex}}{\to}$ “
\mathrm{#1/tex name.
}+\newline#2.”$]$

[string(x) + y $\overset{\text{pyk}}{\to}$ “text ∗ plus ∗”]

string(∗) ++ ∗

[string(x) ++ y $\overset{\text{name}}{\to}$ “\mbox{string}(#1.
)\mathrel{++}#2.”]

[string(x) ++ y $\overset{\text{tex}}{\to}$ “
\mathrm{#1/tex name.
}\;{++}\newline{}\qquad#2.”]

[string(x) ++ y $\overset{\text{pyk}}{\to}$ “text ∗ plus indent ∗”]

bracket ∗ end bracket

[bracket x end bracket $\overset{\text{name}}{\to}$ “
\mbox{bracket $#1.$ end bracket}”]

[bracket x end bracket $\overset{\text{tex}}{\to}$ “$[#1.]$”]

[bracket x end bracket $\overset{\text{pyk}}{\to}$ “bracket ∗ end bracket”]

big bracket ∗ end bracket

[big bracket x end bracket $\overset{\text{name}}{\to}$ “
\mbox{big bracket $#1.$ end bracket}”]

[big bracket x end bracket $\overset{\text{tex}}{\to}$ “$\left[#1.\right]$”]

[big bracket x end bracket $\overset{\text{pyk}}{\to}$ “big bracket ∗ end bracket”]

math ∗ end math

[math x end math $\overset{\text{name}}{\to}$ “
\mbox{math $#1.$ end math}”]

[math x end math $\overset{\text{tex}}{\to}$ “$#1.$”]

[math x end math $\overset{\text{pyk}}{\to}$ “math ∗ end math”]

flush left [∗]

[**flush left** [x] $\overset{\text{name}}{\longrightarrow}$ “
\mathbf{flush\ left\ }[#1.
]”]

[**flush left** [x] $\overset{\text{tex}}{\longrightarrow}$ “
\begin {flushleft}#1.
\end {flushleft}”]

[**flush left** [x] $\overset{\text{pyk}}{\longrightarrow}$ “flush left ∗ end left”]

x

[x $\overset{\text{tactic}}{\longrightarrow}$ y]

[x $\overset{\text{stmt}}{\longrightarrow}$ x]

[x $\overset{\text{msg}}{\longrightarrow}$ y]

[x $\overset{\text{claim}}{\longrightarrow}$ y]

[x $\overset{\text{tex}}{\longrightarrow}$ “
\mathsf{x}”]

[x $\overset{\text{pyk}}{\longrightarrow}$ “var x”]

y

[y $\overset{\text{x}}{\longrightarrow}$ z]

[y $\overset{\text{tex}}{\longrightarrow}$ “
\mathsf{y}”]

[y $\overset{\text{pyk}}{\longrightarrow}$ “var y”]

z

[z $\overset{\text{tex}}{\longrightarrow}$ “
\mathsf{z}”]

[z $\overset{\text{pyk}}{\longrightarrow}$ “var z”]

$[* \xrightarrow{*} *]$

Predef: define

[[y $\xrightarrow{x}$ z] $\xrightarrow{tex}$ “
[#2/tex name/tex.
\stackrel{#1.
}{\rightarrow}#3.
]”]

[[y $\xrightarrow{x}$ z] $\xrightarrow{pyk}$ “define ∗ of ∗ as ∗ end define”]

pyk

Predef: pyk

[pyk $\xrightarrow{tex}$ “
\mathrm{pyk}”]

[pyk $\xrightarrow{pyk}$ “pyk”]

tex

Predef: tex

[tex $\xrightarrow{tex}$ “
\mathrm{tex}”]

[tex $\xrightarrow{pyk}$ “tex”]

name

Predef: texname

[name $\xrightarrow{tex}$ “
\mathrm{name}”]

[name $\xrightarrow{pyk}$ “tex name”]

prio

Predef: priority

[prio $\overset{\text{tex}}{\to}$ “
\mathrm{prio}”]

[prio $\overset{\text{pyk}}{\to}$ “priority”]

T

Predef: true
[T $\overset{\text{tex}}{\to}$ “
\mathsf {T}”]

[T $\overset{\text{pyk}}{\to}$ “true”]

$\mathrm{if}(*, *, *)$

Predef: if
[$\mathrm{if}(*, *, *)$ $\overset{\text{tex}}{\to}$ “
\mathrm {if}(#1.
, \linebreak [0]#2.
, \linebreak [0]#3.
)”]

[$\mathrm{if}(*, *, *)$ $\overset{\text{pyk}}{\to}$ “if $*$ then $*$ else $*$ end if”]

$[* \overset{*}{\Rightarrow} *]$

Predef: introduce
[$[* \overset{*}{\Rightarrow} *]$ $\overset{\text{tex}}{\to}$ “
[#2/tex name/tex.
\stackrel {#1.
}{\Rightarrow }#3.
]”]

[$[* \overset{*}{\Rightarrow} *]$ $\overset{\text{pyk}}{\to}$ “introduce $*$ of $*$ as $*$ end introduce”]

val

Predef: value
[val $\overset{\text{tex}}{\to}$ “
\mathrm {val}”]

[val $\overset{\text{pyk}}{\to}$ “value”]

claim

Predef: claim
[claim $\overset{\text{tex}}{\to}$ “
\mathrm {claim}”]
[claim $\overset{\text{pyk}}{\to}$ “claim”]

∗

[x $\overset{\text{name}}{\to}$ “
\linebreak [0]\ \hskip0em plus2.0em{}#1.”]
[x $\overset{\text{tex}}{\to}$ “ #1.”]
[x $\overset{\text{pyk}}{\to}$ “unicode space ∗”]

!∗

[!x $\overset{\text{tex}}{\to}$ “!#1.”]
[!x $\overset{\text{pyk}}{\to}$ “unicode exclamation mark ∗”]

”∗

[”x $\overset{\text{tex}}{\to}$ “”#1.”]
[”x $\overset{\text{pyk}}{\to}$ “unicode quotation mark ∗”]

#∗

[#x $\overset{\text{name}}{\to}$ “
\#.#1.”]
[#x $\overset{\text{tex}}{\to}$ “#.#1.”]
[#x $\overset{\text{pyk}}{\to}$ “unicode number sign ∗”]

$*

[$x $\overset{\text{name}}{\rightarrow}$ “
\$#1.”]

[$x $\overset{\text{tex}}{\rightarrow}$ “$#1.”]

[$x $\overset{\text{pyk}}{\rightarrow}$ “unicode dollar sign ∗”]

%*

[%x $\overset{\text{name}}{\rightarrow}$ “
\%#1.”]

[%x $\overset{\text{tex}}{\rightarrow}$ “%#1.”]

[%x $\overset{\text{pyk}}{\rightarrow}$ “unicode percent ∗”]

&*

[&x $\overset{\text{name}}{\rightarrow}$ “
\&#1.”]

[&x $\overset{\text{tex}}{\rightarrow}$ “&#1.”]

[&x $\overset{\text{pyk}}{\rightarrow}$ “unicode ampersand ∗”]

’*

[’x $\overset{\text{name}}{\rightarrow}$ “
\mbox {’}#1.”]

[’x $\overset{\text{tex}}{\rightarrow}$ “’#1.”]

[’x $\overset{\text{pyk}}{\rightarrow}$ “unicode apostrophe ∗”]

(*

[(x $\overset{\text{tex}}{\rightarrow}$ “(#1.”]

[(x $\overset{\text{pyk}}{\rightarrow}$ “unicode left parenthesis ∗”]

)*

[)x $\overset{\text{tex}}{\to}$ “)#1.”]

[)x $\overset{\text{pyk}}{\to}$ “unicode right parenthesis ∗”]

**

[∗x $\overset{\text{name}}{\to}$ “
{∗}#1.”]

[∗x $\overset{\text{tex}}{\to}$ “∗#1.”]

[∗x $\overset{\text{pyk}}{\to}$ “unicode asterisk ∗”]

+*

[+x $\overset{\text{name}}{\to}$ “
{+}#1.”]

[+x $\overset{\text{tex}}{\to}$ “+#1.”]

[+x $\overset{\text{pyk}}{\to}$ “unicode plus sign ∗”]

, *

[,x $\overset{\text{tex}}{\to}$ “,#1.”]

[,x $\overset{\text{pyk}}{\to}$ “unicode comma ∗”]

-*

[-x $\overset{\text{name}}{\to}$ “
\mbox{-}#1.”]

[-x $\overset{\text{tex}}{\to}$ “-#1.”]

[-x $\overset{\text{pyk}}{\to}$ “unicode hyphen ∗”]

.*

[.x $\overset{\text{tex}}{\to}$ “.#1.”]

[.x $\overset{\text{pyk}}{\rightarrow}$ “unicode period ∗”]

/∗

[/x $\overset{\text{tex}}{\rightarrow}$ “/#1.”]

[/x $\overset{\text{pyk}}{\rightarrow}$ “unicode slash ∗”]

0∗

[0x $\overset{\text{tex}}{\rightarrow}$ “0#1.”]

[0x $\overset{\text{pyk}}{\rightarrow}$ “unicode zero ∗”]

1∗

[1x $\overset{\text{tex}}{\rightarrow}$ “1#1.”]

[1x $\overset{\text{pyk}}{\rightarrow}$ “unicode one ∗”]

2∗

[2x $\overset{\text{tex}}{\rightarrow}$ “2#1.”]

[2x $\overset{\text{pyk}}{\rightarrow}$ “unicode two ∗”]

3∗

[3x $\overset{\text{tex}}{\rightarrow}$ “3#1.”]

[3x $\overset{\text{pyk}}{\rightarrow}$ “unicode three ∗”]

4∗

[4x $\overset{\text{tex}}{\rightarrow}$ “4#1.”]

[4x $\overset{\text{pyk}}{\rightarrow}$ “unicode four ∗”]

5∗

[5x $\overset{\text{tex}}{\rightarrow}$ “5#1.”]

[5x $\overset{\text{pyk}}{\rightarrow}$ “unicode five ∗”]

6∗

[6x $\overset{\text{tex}}{\rightarrow}$ “6#1.”]

[6x $\overset{\text{pyk}}{\rightarrow}$ “unicode six ∗”]

7∗

[7x $\overset{\text{tex}}{\rightarrow}$ “7#1.”]

[7x $\overset{\text{pyk}}{\rightarrow}$ “unicode seven ∗”]

8∗

[8x $\overset{\text{tex}}{\rightarrow}$ “8#1.”]

[8x $\overset{\text{pyk}}{\rightarrow}$ “unicode eight ∗”]

9∗

[9x $\overset{\text{tex}}{\rightarrow}$ “9#1.”]

[9x $\overset{\text{pyk}}{\rightarrow}$ “unicode nine ∗”]

:∗

[:x $\overset{\text{name}}{\rightarrow}$ “
{:}#1.”]

[:x $\overset{\text{tex}}{\rightarrow}$ “:#1.”]

[:x $\overset{\text{pyk}}{\rightarrow}$ “unicode colon ∗”]

;∗

[;x $\overset{\text{tex}}{\to}$ “;#1.”]

[;x $\overset{\text{pyk}}{\to}$ “unicode semicolon ∗”]

<∗

[<x $\overset{\text{name}}{\to}$ “
{<}#1.”]

[<x $\overset{\text{tex}}{\to}$ “<#1.”]

[<x $\overset{\text{pyk}}{\to}$ “unicode less than ∗”]

=∗

[=x $\overset{\text{name}}{\to}$ “
{=}#1.”]

[=x $\overset{\text{tex}}{\to}$ “=#1.”]

[=x $\overset{\text{pyk}}{\to}$ “unicode equal sign ∗”]

>∗

[>x $\overset{\text{name}}{\to}$ “
{>}#1.”]

[>x $\overset{\text{tex}}{\to}$ “>#1.”]

[>x $\overset{\text{pyk}}{\to}$ “unicode greater than ∗”]

?∗

[?x $\overset{\text{tex}}{\to}$ “?#1.”]

[?x $\overset{\text{pyk}}{\to}$ “unicode question mark ∗”]

@∗

[@x $\overset{\text{tex}}{\to}$ “@#1.”]

[@x $\overset{\text{pyk}}{\to}$ “unicode commercial at ∗”]

A∗

[Ax $\overset{\text{tex}}{\to}$ “A#1.”]

[Ax $\overset{\text{pyk}}{\to}$ “unicode capital a ∗”]

B∗

[Bx $\overset{\text{tex}}{\to}$ “B#1.”]

[Bx $\overset{\text{pyk}}{\to}$ “unicode capital b ∗”]

C∗

[Cx $\overset{\text{tex}}{\to}$ “C#1.”]

[Cx $\overset{\text{pyk}}{\to}$ “unicode capital c ∗”]

D∗

[Dx $\overset{\text{tex}}{\to}$ “D#1.”]

[Dx $\overset{\text{pyk}}{\to}$ “unicode capital d ∗”]

E∗

[Ex $\overset{\text{tex}}{\to}$ “E#1.”]

[Ex $\overset{\text{pyk}}{\to}$ “unicode capital e ∗”]

F∗

[Fx $\overset{\text{tex}}{\to}$ “F#1.”]

[Fx $\overset{\text{pyk}}{\to}$ “unicode capital f ∗”]

G∗

[Gx $\overset{\text{tex}}{\to}$ “G#1.”]

[Gx $\overset{\text{pyk}}{\to}$ “unicode capital g ∗”]

H∗

[Hx $\overset{\text{tex}}{\to}$ “H#1.”]

[Hx $\overset{\text{pyk}}{\to}$ “unicode capital h ∗”]

I∗

[Ix $\overset{\text{tex}}{\to}$ “I#1.”]

[Ix $\overset{\text{pyk}}{\to}$ “unicode capital i ∗”]

J∗

[Jx $\overset{\text{tex}}{\to}$ “J#1.”]

[Jx $\overset{\text{pyk}}{\to}$ “unicode capital j ∗”]

K∗

[Kx $\overset{\text{tex}}{\to}$ “K#1.”]

[Kx $\overset{\text{pyk}}{\to}$ “unicode capital k ∗”]

L∗

[Lx $\overset{\text{tex}}{\to}$ “L#1.”]

[Lx $\overset{\text{pyk}}{\to}$ “unicode capital l ∗”]

M∗

[Mx $\overset{\text{tex}}{\to}$ “M#1.”]

[Mx $\overset{\text{pyk}}{\to}$ “unicode capital m $*$”]

N$*$

[Nx $\overset{\text{tex}}{\to}$ “N#1.”]

[Nx $\overset{\text{pyk}}{\to}$ “unicode capital n $*$”]

O$*$

[Ox $\overset{\text{tex}}{\to}$ “O#1.”]

[Ox $\overset{\text{pyk}}{\to}$ “unicode capital o $*$”]

P$*$

[Px $\overset{\text{tex}}{\to}$ “P#1.”]

[Px $\overset{\text{pyk}}{\to}$ “unicode capital p $*$”]

Q$*$

[Qx $\overset{\text{tex}}{\to}$ “Q#1.”]

[Qx $\overset{\text{pyk}}{\to}$ “unicode capital q $*$”]

R$*$

[Rx $\overset{\text{tex}}{\to}$ “R#1.”]

[Rx $\overset{\text{pyk}}{\to}$ “unicode capital r $*$”]

S$*$

[Sx $\overset{\text{tex}}{\to}$ “S#1.”]

[Sx $\overset{\text{pyk}}{\to}$ “unicode capital s $*$”]

T∗

[Tx $\overset{\text{tex}}{\to}$ “T#1.”]

[Tx $\overset{\text{pyk}}{\to}$ “unicode capital t ∗”]

U∗

[Ux $\overset{\text{tex}}{\to}$ “U#1.”]

[Ux $\overset{\text{pyk}}{\to}$ “unicode capital u ∗”]

V∗

[Vx $\overset{\text{tex}}{\to}$ “V#1.”]

[Vx $\overset{\text{pyk}}{\to}$ “unicode capital v ∗”]

W∗

[Wx $\overset{\text{tex}}{\to}$ “W#1.”]

[Wx $\overset{\text{pyk}}{\to}$ “unicode capital w ∗”]

X∗

[Xx $\overset{\text{tex}}{\to}$ “X#1.”]

[Xx $\overset{\text{pyk}}{\to}$ “unicode capital x ∗”]

Y∗

[Yx $\overset{\text{tex}}{\to}$ “Y#1.”]

[Yx $\overset{\text{pyk}}{\to}$ “unicode capital y ∗”]

Z∗

[Zx $\overset{\text{tex}}{\to}$ “Z#1.”]

[Zx $\overset{\text{pyk}}{\to}$ “unicode capital z ∗”]

[∗

[[x $\overset{\text{tex}}{\to}$ “[#1.”]

[[x $\overset{\text{pyk}}{\to}$ “unicode left bracket ∗”]

\∗

[\x $\overset{\text{name}}{\to}$ “
\mbox {$\backslash $}#1.”]

[\x $\overset{\text{tex}}{\to}$ “\#1.”]

[\x $\overset{\text{pyk}}{\to}$ “unicode backslash ∗”]

]∗

[]x $\overset{\text{tex}}{\to}$ “]#1.”]

[]x $\overset{\text{pyk}}{\to}$ “unicode right bracket ∗”]

ˆ∗

[ˆx $\overset{\text{name}}{\to}$ “
{\char94}#1.”]

[ˆx $\overset{\text{tex}}{\to}$ “ˆ#1.”]

[ˆx $\overset{\text{pyk}}{\to}$ “unicode circumflex ∗”]

_∗

[_x $\overset{\text{name}}{\to}$ “
_#1.”]

[_x $\overset{\text{tex}}{\to}$ “_#1.”]

[_x $\overset{\text{pyk}}{\to}$ “unicode underscore ∗”]

‘∗

[‘x $\overset{\text{name}}{\to}$ “
\mbox {‘}#1.”]

[‘x $\overset{\text{tex}}{\to}$ “‘#1.”]

[‘x $\overset{\text{pyk}}{\to}$ “unicode grave accent ∗”]

a∗

[ax $\overset{\text{tex}}{\to}$ “a#1.”]

[ax $\overset{\text{pyk}}{\to}$ “unicode small a ∗”]

b∗

[bx $\overset{\text{tex}}{\to}$ “b#1.”]

[bx $\overset{\text{pyk}}{\to}$ “unicode small b ∗”]

c∗

[cx $\overset{\text{tex}}{\to}$ “c#1.”]

[cx $\overset{\text{pyk}}{\to}$ “unicode small c ∗”]

d∗

[dx $\overset{\text{tex}}{\to}$ “d#1.”]

[dx $\overset{\text{pyk}}{\to}$ “unicode small d ∗”]

e∗

[ex $\overset{\text{tex}}{\to}$ “e#1.”]

[ex $\overset{\text{pyk}}{\to}$ “unicode small e ∗”]

f∗

[fx $\overset{\text{tex}}{\rightarrow}$ “f#1.”]

[fx $\overset{\text{pyk}}{\rightarrow}$ “unicode small f ∗”]

g∗

[gx $\overset{\text{tex}}{\rightarrow}$ “g#1.”]

[gx $\overset{\text{pyk}}{\rightarrow}$ “unicode small g ∗”]

h∗

[hx $\overset{\text{tex}}{\rightarrow}$ “h#1.”]

[hx $\overset{\text{pyk}}{\rightarrow}$ “unicode small h ∗”]

i∗

[ix $\overset{\text{tex}}{\rightarrow}$ “i#1.”]

[ix $\overset{\text{pyk}}{\rightarrow}$ “unicode small i ∗”]

j∗

[jx $\overset{\text{tex}}{\rightarrow}$ “j#1.”]

[jx $\overset{\text{pyk}}{\rightarrow}$ “unicode small j ∗”]

k∗

[kx $\overset{\text{tex}}{\rightarrow}$ “k#1.”]

[kx $\overset{\text{pyk}}{\rightarrow}$ “unicode small k ∗”]

l∗

[lx $\overset{\text{tex}}{\rightarrow}$ “l#1.”]

[lx $\overset{\text{pyk}}{\to}$ “unicode small l $*$”]

m$*$

[mx $\overset{\text{tex}}{\to}$ “m#1.”]

[mx $\overset{\text{pyk}}{\to}$ “unicode small m $*$”]

n$*$

[nx $\overset{\text{tex}}{\to}$ “n#1.”]

[nx $\overset{\text{pyk}}{\to}$ “unicode small n $*$”]

o$*$

[ox $\overset{\text{tex}}{\to}$ “o#1.”]

[ox $\overset{\text{pyk}}{\to}$ “unicode small o $*$”]

p$*$

[px $\overset{\text{tex}}{\to}$ “p#1.”]

[px $\overset{\text{pyk}}{\to}$ “unicode small p $*$”]

q$*$

[qx $\overset{\text{tex}}{\to}$ “q#1.”]

[qx $\overset{\text{pyk}}{\to}$ “unicode small q $*$”]

r$*$

[rx $\overset{\text{tex}}{\to}$ “r#1.”]

[rx $\overset{\text{pyk}}{\to}$ “unicode small r $*$”]

s∗

[sx $\overset{\text{tex}}{\rightarrow}$ “s#1.”]

[sx $\overset{\text{pyk}}{\rightarrow}$ “unicode small s ∗”]

t∗

[tx $\overset{\text{tex}}{\rightarrow}$ “t#1.”]

[tx $\overset{\text{pyk}}{\rightarrow}$ “unicode small t ∗”]

u∗

[ux $\overset{\text{tex}}{\rightarrow}$ “u#1.”]

[ux $\overset{\text{pyk}}{\rightarrow}$ “unicode small u ∗”]

v∗

[vx $\overset{\text{tex}}{\rightarrow}$ “v#1.”]

[vx $\overset{\text{pyk}}{\rightarrow}$ “unicode small v ∗”]

w∗

[wx $\overset{\text{tex}}{\rightarrow}$ “w#1.”]

[wx $\overset{\text{pyk}}{\rightarrow}$ “unicode small w ∗”]

x∗

[xx $\overset{\text{tex}}{\rightarrow}$ “x#1.”]

[xx $\overset{\text{pyk}}{\rightarrow}$ “unicode small x ∗”]

y∗

[yx $\overset{\text{tex}}{\rightarrow}$ “y#1.”]

[yx $\overset{\text{pyk}}{\to}$ “unicode small y $*$”]

Z$*$

[zx $\overset{\text{tex}}{\to}$ “z#1.”]

[zx $\overset{\text{pyk}}{\to}$ “unicode small z $*$”]

$\{*$

[{x $\overset{\text{name}}{\to}$ “
\{#1.”]

[{x $\overset{\text{tex}}{\to}$ “{#1.”]

[{x $\overset{\text{pyk}}{\to}$ “unicode left brace $*$”]

$|*$

[|x $\overset{\text{tex}}{\to}$ “|#1.”]

[|x $\overset{\text{pyk}}{\to}$ “unicode vertical line $*$”]

$\}*$

[}x $\overset{\text{name}}{\to}$ “
\}#1.”]

[}x $\overset{\text{tex}}{\to}$ “}#1.”]

[}x $\overset{\text{pyk}}{\to}$ “unicode right brace $*$”]

$\tilde{}*$

[~x $\overset{\text{name}}{\to}$ “
\char126 #1.”]

[~x $\overset{\text{tex}}{\to}$ “~#1.”]

[~x $\overset{\text{pyk}}{\to}$ “unicode tilde $*$”]

$\bot$

$[\bot \overset{\text{val}}{\Rightarrow} (\lambda \mathsf{x}.\ [\ \mathsf{x}\ '\ \mathsf{x}\ ]\ )^{\mathrm{I}}\ '\ (\lambda \mathsf{x}.\ [\ \mathsf{x}\ '\ \mathsf{x}\ ]\ )^{\mathrm{I}}]$

$[\bot \overset{\text{tex}}{\rightarrow}$ “
\bot ”]

$[\bot \overset{\text{pyk}}{\rightarrow}$ “bottom”]

$\mathrm{f}(*)$

$[\mathrm{f}(\mathsf{x}) \overset{\text{val}}{\rightarrow} \mathrm{if}(\mathsf{x}, \mathsf{T}, \mathrm{f}(\mathsf{x}\ '\ \mathsf{T}))]$

$[\mathrm{f}(*) \overset{\text{tex}}{\rightarrow}$ “
f(#1.
)”]

$[\mathrm{f}(*) \overset{\text{pyk}}{\rightarrow}$ “function f of $*$ end function”]

$(*)^{\mathrm{I}}$

$[(\mathsf{x})^{\mathrm{I}} \overset{\text{val}}{\rightarrow} \mathsf{x}]$

$[(*)^{\mathrm{I}} \overset{\text{tex}}{\rightarrow}$ “
(#1.
)\{\}\^{}\{I\} ”]

$[(*)^{\mathrm{I}} \overset{\text{pyk}}{\rightarrow}$ “identity $*$ end identity”]

F

$[\mathsf{F} \overset{\text{val}}{\Rightarrow} \mathsf{T} \therefore \mathsf{T}]$

$[\mathsf{F} \overset{\text{tex}}{\rightarrow}$ “
\mathsf {F}”]

$[\mathsf{F} \overset{\text{pyk}}{\rightarrow}$ “false”]

$\underline{0}$

$[\underline{0} \overset{\text{val}}{\rightarrow} \mathsf{T}]$

$[\underline{0} \overset{\text{tex}}{\rightarrow}$ “
\underline {0}”]

$[\underline{0} \overset{\text{pyk}}{\rightarrow}$ “untagged zero”]

$\underline{1}$

$[\underline{1} \overset{\text{val}}{\rightarrow} \mathsf{F}\ \underline{+2*}\ \underline{0}]$

$[\underline{1} \overset{\text{tex}}{\rightarrow}$ “
\underline {1}”]

$[\underline{1} \overset{\text{pyk}}{\rightarrow}$ “untagged one”]

$\underline{2}$

$[\underline{2} \overset{\text{val}}{\rightarrow} \mathsf{T}\ \underline{+2*}\ \underline{1}]$

$[\underline{2} \overset{\text{tex}}{\rightarrow}$ “
\underline {2}”]

$[\underline{2} \overset{\text{pyk}}{\rightarrow}$ “untagged two”]

$\underline{3}$

$[\underline{3} \overset{\text{val}}{\rightarrow} \mathsf{F}\ \underline{+2*}\ \underline{1}]$

$[\underline{3} \overset{\text{tex}}{\rightarrow}$ “
\underline {3}”]

$[\underline{3} \overset{\text{pyk}}{\rightarrow}$ “untagged three”]

$\underline{4}$

$[\underline{4} \overset{\text{val}}{\rightarrow} \mathsf{T}\ \underline{+2*}\ \underline{2}]$

$[\underline{4} \overset{\text{tex}}{\rightarrow}$ “
\underline {4}”]

$[\underline{4} \overset{\text{pyk}}{\rightarrow}$ “untagged four”]

5

[5 $\overset{\text{val}}{\rightarrow}$ F +2* 2]

[5 $\overset{\text{tex}}{\rightarrow}$ “
\underline {5}”]

[5 $\overset{\text{pyk}}{\rightarrow}$ “untagged five”]

6

[6 $\overset{\text{val}}{\rightarrow}$ T +2* 3]

[6 $\overset{\text{tex}}{\rightarrow}$ “
\underline {6}”]

[6 $\overset{\text{pyk}}{\rightarrow}$ “untagged six”]

7

[7 $\overset{\text{val}}{\rightarrow}$ F +2* 3]

[7 $\overset{\text{tex}}{\rightarrow}$ “
\underline {7}”]

[7 $\overset{\text{pyk}}{\rightarrow}$ “untagged seven”]

8

[8 $\overset{\text{val}}{\rightarrow}$ T +2* 4]

[8 $\overset{\text{tex}}{\rightarrow}$ “
\underline {8}”]

[8 $\overset{\text{pyk}}{\rightarrow}$ “untagged eight”]

9

[9 $\overset{\text{val}}{\rightarrow}$ F +2* 4]

[9 $\overset{\text{tex}}{\rightarrow}$ “
\underline {9}”]

[$\underline{9} \overset{\text{pyk}}{\rightarrow}$ “untagged nine”]

0

[$0 \overset{\text{val}}{\Rightarrow} \mathsf{T} \mathrel{.\,.} \mathsf{T}$]

[$0 \overset{\text{tex}}{\rightarrow}$ “
0”]

[$0 \overset{\text{pyk}}{\rightarrow}$ “zero”]

1

[$1 \overset{\text{val}}{\rightarrow} \mathsf{F}\ {+}2{*}\ 0$]

[$1 \overset{\text{tex}}{\rightarrow}$ “
1”]

[$1 \overset{\text{pyk}}{\rightarrow}$ “one”]

2

[$2 \overset{\text{val}}{\rightarrow} \mathsf{T}\ {+}2{*}\ 1$]

[$2 \overset{\text{tex}}{\rightarrow}$ “
2”]

[$2 \overset{\text{pyk}}{\rightarrow}$ “two”]

3

[$3 \overset{\text{val}}{\rightarrow} \mathsf{F}\ {+}2{*}\ 1$]

[$3 \overset{\text{tex}}{\rightarrow}$ “
3”]

[$3 \overset{\text{pyk}}{\rightarrow}$ “three”]

4

[$4 \overset{\text{val}}{\rightarrow} \mathsf{T}\ {+}2{*}\ 2$]

[4 $\overset{\text{tex}}{\to}$ “
4”]

[4 $\overset{\text{pyk}}{\to}$ “four”]

5

[5 $\overset{\text{val}}{\to}$ F +2∗ 2]

[5 $\overset{\text{tex}}{\to}$ “
5”]

[5 $\overset{\text{pyk}}{\to}$ “five”]

6

[6 $\overset{\text{val}}{\to}$ T +2∗ 3]

[6 $\overset{\text{tex}}{\to}$ “
6”]

[6 $\overset{\text{pyk}}{\to}$ “six”]

7

[7 $\overset{\text{val}}{\to}$ F +2∗ 3]

[7 $\overset{\text{tex}}{\to}$ “
7”]

[7 $\overset{\text{pyk}}{\to}$ “seven”]

8

[8 $\overset{\text{val}}{\to}$ T +2∗ 4]

[8 $\overset{\text{tex}}{\to}$ “
8”]

[8 $\overset{\text{pyk}}{\to}$ “eight”]

9

[9 $\overset{\text{val}}{\rightarrow}$ F +2∗ 4]

[9 $\overset{\text{tex}}{\rightarrow}$ “
9”]

[9 $\overset{\text{pyk}}{\rightarrow}$ “nine”]

a

[a $\overset{\text{tex}}{\rightarrow}$ “
\mathsf {a}”]

[a $\overset{\text{pyk}}{\rightarrow}$ “var a”]

b

[b $\overset{\text{tex}}{\rightarrow}$ “
\mathsf {b}”]

[b $\overset{\text{pyk}}{\rightarrow}$ “var b”]

c

[c $\overset{\text{tex}}{\rightarrow}$ “
\mathsf {c}”]

[c $\overset{\text{pyk}}{\rightarrow}$ “var c”]

d

[d $\overset{\text{tex}}{\rightarrow}$ “
\mathsf {d}”]

[d $\overset{\text{pyk}}{\rightarrow}$ “var d”]

e

[e $\overset{\text{tex}}{\rightarrow}$ “
\mathsf {e}”]

[e $\overset{\text{pyk}}{\to}$ “var e”]

f

[f $\overset{\text{tex}}{\to}$ “
\mathsf {f}”]

[f $\overset{\text{pyk}}{\to}$ “var f”]

g

[g $\overset{\text{tex}}{\to}$ “
\mathsf {g}”]

[g $\overset{\text{pyk}}{\to}$ “var g”]

h

[h $\overset{\text{tex}}{\to}$ “
\mathsf {h}”]

[h $\overset{\text{pyk}}{\to}$ “var h”]

i

[i $\overset{\text{tex}}{\to}$ “
\mathsf {i}”]

[i $\overset{\text{pyk}}{\to}$ “var i”]

j

[j $\overset{\text{tex}}{\to}$ “
\mathsf {j}”]

[j $\overset{\text{pyk}}{\to}$ “var j”]

k

[k $\overset{\text{tex}}{\to}$ “
\mathsf {k}”]

[k $\overset{\text{pyk}}{\to}$ “var k”]

l

[l $\overset{\text{tex}}{\to}$ “
\mathsf {l}”]

[l $\overset{\text{pyk}}{\to}$ “var l”]

m

[m $\overset{\text{tex}}{\to}$ “
\mathsf {m}”]

[m $\overset{\text{pyk}}{\to}$ “var m”]

n

[n $\overset{\text{tex}}{\to}$ “
\mathsf {n}”]

[n $\overset{\text{pyk}}{\to}$ “var n”]

o

[o $\overset{\text{tex}}{\to}$ “
\mathsf {o}”]

[o $\overset{\text{pyk}}{\to}$ “var o”]

p

[p $\overset{\text{tex}}{\to}$ “
\mathsf {p}”]

[p $\overset{\text{pyk}}{\to}$ “var p”]

q

$[\mathsf{q} \overset{\text{tex}}{\longrightarrow} \text{“}\backslash\text{mathsf } \{\text{q}\}\text{”}]$

$[\mathsf{q} \overset{\text{pyk}}{\longrightarrow} \text{“var q”}]$

r

$[\mathsf{r} \overset{\text{tex}}{\longrightarrow} \text{“}\backslash\text{mathsf } \{\text{r}\}\text{”}]$

$[\mathsf{r} \overset{\text{pyk}}{\longrightarrow} \text{“var r”}]$

s

$[\mathsf{s} \overset{\text{tex}}{\longrightarrow} \text{“}\backslash\text{mathsf } \{\text{s}\}\text{”}]$

$[\mathsf{s} \overset{\text{pyk}}{\longrightarrow} \text{“var s”}]$

t

$[\mathsf{t} \overset{\text{tex}}{\longrightarrow} \text{“}\backslash\text{mathsf } \{\text{t}\}\text{”}]$

$[\mathsf{t} \overset{\text{pyk}}{\longrightarrow} \text{“var t”}]$

u

$[\mathsf{u} \overset{\text{tex}}{\longrightarrow} \text{“}\backslash\text{mathsf } \{\text{u}\}\text{”}]$

$[\mathsf{u} \overset{\text{pyk}}{\longrightarrow} \text{“var u”}]$

v

$[\mathsf{v} \overset{\text{tex}}{\longrightarrow} \text{“}\backslash\text{mathsf } \{\text{v}\}\text{”}]$

$[\mathsf{v} \overset{\text{pyk}}{\longrightarrow} \text{“var v”}]$

w

$[\mathsf{w} \overset{\text{tex}}{\to} \text{“}$
$\backslash\text{mathsf }\{\text{w}\}\text{”}]$

$[\mathsf{w} \overset{\text{pyk}}{\to} \text{“var w”}]$

$\big(*\big)^{\mathrm{M}}$

$[(\mathsf{x})^{\mathrm{M}} \overset{\text{val}}{\to} \mathsf{x}^{\mathrm{M}}]$

$[(*)^{\mathrm{M}} \overset{\text{tex}}{\to} \text{“}$
$(\#1.$
$)\hat{}\,\mathrm{M}\text{”}]$

$[(*)^{\mathrm{M}} \overset{\text{pyk}}{\to} \text{“tagged parenthesis } * \text{ end tagged”}]$

$\mathrm{If}\big(*, *, *\big)$

$[\mathrm{If}(\mathsf{x}, \mathsf{y}, \mathsf{z}) \overset{\text{val}}{\Rightarrow} \mathrm{if}(\mathsf{x}^{\mathrm{M}}, \mathsf{y}^{\mathrm{M}}, \mathsf{z}^{\mathrm{M}})]$

$[\mathrm{If}(*, *, *) \overset{\text{tex}}{\to} \text{“}$
$\backslash\text{mathrm }\{\text{If}\}(\#1.$
$,\backslash\text{linebreak }[0]\#2.$
$,\backslash\text{linebreak }[0]\#3.$
$)\text{”}]$

$[\mathrm{If}(*, *, *) \overset{\text{pyk}}{\to} \text{“tagged if } * \text{ then } * \text{ else } * \text{ end if”}]$

$\mathrm{array}\{*\} * \mathrm{end\ array}$

$[\mathrm{array}\{*\} * \mathrm{end\ array} \overset{\text{name}}{\to} \text{“}\backslash\text{mathrm }\{\text{array}\}\backslash\{\#1.$
$\backslash\}\#2.$
$\backslash\text{mathrm }\{\text{end}\backslash\text{ array}\}\text{”}]$

$[\mathrm{array}\{*\} * \mathrm{end\ array} \overset{\text{tex}}{\to} \text{“}$
$\backslash\text{begin }\{\text{array}\}\{\#1.$
$\}\#2.$
$\backslash\text{end }\{\text{array}\}\text{”}]$

$[\mathrm{array}\{*\} * \mathrm{end\ array} \overset{\text{pyk}}{\to} \text{“array } * \text{ is } * \text{ end array”}]$

l

[l $\overset{\text{tex}}{\to}$ “
l”]

[l $\overset{\text{pyk}}{\to}$ “left”]

c

[c $\overset{\text{tex}}{\to}$ “
c”]

[c $\overset{\text{pyk}}{\to}$ “center”]

r

[r $\overset{\text{tex}}{\to}$ “
r”]

[r $\overset{\text{pyk}}{\to}$ “right”]

empty

[empty $\overset{\text{name}}{\to}$ “
\mathrm {empty}”]

[empty $\overset{\text{tex}}{\to}$ “
”]

[empty $\overset{\text{pyk}}{\to}$ “empty”]

$\langle * \mid * := * \rangle$

[$\langle * \mid * := * \rangle$ $\overset{\text{tex}}{\to}$ “
\langle #1.
\, {|}#2.
{:=}\, #3.
\rangle ”]

[$\langle * \mid * := * \rangle$ $\overset{\text{pyk}}{\to}$ “substitute $*$ set $*$ to $*$ end substitute”]

$\mathcal{M}(*)$

$[\mathcal{M}(\mathsf{x}) \overset{\text{val}}{\to} (\underline{0} \mathbin{\underline{\cdot\cdot}} [\ \underline{1} \mathbin{\underline{\cdot\cdot}} \mathsf{T}\ ])^{\mathrm{I}} \mathbin{\cdot\cdot} \mathsf{x}]$

$[\mathcal{M}(*) \overset{\text{tex}}{\to} \text{“}$
{\cal M}(#1.
)”]

$[\mathcal{M}(*) \overset{\text{pyk}}{\to} \text{“map tag } * \text{ end tag”}]$

$\tilde{\mathcal{U}}(*)$

$[\tilde{\mathcal{U}}(\mathsf{x}) \overset{\text{val}}{\to} \text{if}(\mathsf{x}^{\mathrm{d}}, \mathsf{x}, \mathsf{x}^{\mathrm{T}})]$

$[\tilde{\mathcal{U}}(*) \overset{\text{tex}}{\to} \text{“}$
\tilde {{\cal U}}(#1.
)”]

$[\tilde{\mathcal{U}}(*) \overset{\text{pyk}}{\to} \text{“raw map untag } * \text{ end untag”}]$

$\mathcal{U}(*)$

$[\mathcal{U}(\mathsf{x}) \overset{\text{val}}{\to} \tilde{\mathcal{U}}(\mathsf{x}^{\mathrm{M}})]$

$[\mathcal{U}(*) \overset{\text{tex}}{\to} \text{“}$
{\cal U}(#1.
)”]

$[\mathcal{U}(*) \overset{\text{pyk}}{\to} \text{“map untag } * \text{ end untag”}]$

$\mathcal{U}^{\mathrm{M}}(*)$

$[\mathcal{U}^{\mathrm{M}}(\mathsf{x}) \overset{\text{val}}{\Rightarrow} \mathcal{U}(\mathsf{x})^{\mathrm{M}}]$

$[\mathcal{U}^{\mathrm{M}}(*) \overset{\text{tex}}{\to} \text{“}$
{\cal U}^M(#1.
)”]

$[\mathcal{U}^{\mathrm{M}}(*) \overset{\text{pyk}}{\to} \text{“normalizing untag } * \text{ end untag”}]$

$\mathbf{apply}(*,*)$

$[\mathbf{apply}(\mathsf{f},\mathsf{x}) \overset{\text{val}}{\Rightarrow} \mathbf{apply}_1(\mathsf{f}^{\mathrm{M}},\mathsf{x}^{\mathrm{M}})]$

$[\mathbf{apply}(*,*) \overset{\text{tex}}{\rightarrow}$ “
\mathbf {apply}(#1.
,#2.
)”]

$[\mathbf{apply}(*,*) \overset{\text{pyk}}{\rightarrow}$ “apply $*$ to $*$ end apply”]

$\mathbf{apply}_1(*,*)$

$[\mathbf{apply}_1(\mathsf{f},\mathsf{x}) \overset{\text{val}}{\rightarrow} \mathsf{f}^{\mathrm{d}} \begin{cases} \mathrm{If}(\mathsf{x}^{\mathrm{d}},\mathsf{f},\mathsf{f}) \\ \mathrm{If}(\mathsf{x}^{\mathrm{d}},\mathcal{M}(\mathsf{f}^{\mathrm{T}},\mathsf{x}),\mathcal{M}(\mathsf{f}^{\mathrm{T}},(\mathsf{x}^{\mathrm{T}})^{\mathrm{I}})) \end{cases}]$

$[\mathbf{apply}_1(*,*) \overset{\text{tex}}{\rightarrow}$ “
\mathbf {apply}_1(#1.
,#2.
)”]

$[\mathbf{apply}_1(*,*) \overset{\text{pyk}}{\rightarrow}$ “apply one $*$ to $*$ end apply”]

$\mathrm{identifier}(*)$

$[\mathrm{identifier}(\mathsf{x}) \overset{\text{val}}{\rightarrow} \mathrm{If}(\mathsf{x}^{\mathrm{t}},0,\mathrm{identifier}_1(\mathsf{x}^{\mathrm{i}},\mathrm{identifier}(\mathsf{x}^1)))]$

$[\mathrm{identifier}(\mathsf{x}) \overset{\text{tex}}{\rightarrow}$ “
identifier(#1.
)”]

$[\mathrm{identifier}(\mathsf{x}) \overset{\text{pyk}}{\rightarrow}$ “identifier $*$ end identifier”]

$\mathrm{identifier}_1(*,*)$

$[\mathrm{identifier}_1(\mathsf{x},\mathsf{y}) \overset{\text{val}}{\rightarrow} \mathrm{If}(\mathsf{x}^6,\mathsf{y},\mathsf{x}^0 +2*\ [\ \mathsf{x}^1 +2*\ [\ \mathsf{x}^2 +2*\ [\ \mathsf{x}^3 +2*\ [\ \mathsf{x}^4 +2*\ [\ \mathsf{x}^5 +2*\ [\ \mathsf{F} +2*\ [\ \mathsf{T} +2*\ \mathsf{y}\ ]\ ]\ ]\ ]\ ]\ ]\ ])]$

$[\mathrm{identifier}_1(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\rightarrow}$ “
identifier_{1}(#1.
, #2.
)”]

$[\text{identifier}_1(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\rightarrow} \text{“identifier one } * \text{ plus id } * \text{ end identifier”}]$

array-plus$(*,*)$

$$[\text{array-plus}(\mathsf{x},\mathsf{y}) \overset{\text{val}}{\rightarrow} \mathsf{x}^{\mathsf{a}} \begin{cases} \mathsf{y}^{\mathsf{a}} \begin{cases} \mathsf{T} \\ \mathsf{y}^{\mathsf{hc}} \begin{cases} \mathsf{y} \\ \mathsf{x} :: \mathsf{y} \end{cases} \end{cases} \\ \mathsf{y}^{\mathsf{a}} \begin{cases} \mathsf{x}^{\mathsf{hc}} \begin{cases} \mathsf{x} \\ \mathsf{x} :: \mathsf{y} \end{cases} \\ \mathsf{x} :: \mathsf{y} \end{cases} \end{cases} \quad]$$

$[\text{array-plus}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\rightarrow} \text{“}$
array\mbox{-}\linebreak[0]plus(#1.
, #2.
)”]

$[\text{array-plus}(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\rightarrow} \text{“array plus } * \text{ and } * \text{ end plus”}]$

array-remove$(*,*,*)$

$[\text{array-remove}(\mathsf{i},\mathsf{a},\mathsf{l}) \overset{\text{val}}{\rightarrow} [\ [$
$\mathsf{i}\ ]\ !\ [\ \mathsf{l}!\ [\ \mathsf{a}^{\mathsf{a}}\ ]\ ]\ ]$

$$\begin{cases} \mathsf{T} \\ \mathsf{a}^{\mathsf{hc}} \begin{cases} [\ \mathsf{a}^{\mathsf{h}} \approx \mathsf{i}\ ] \begin{cases} \mathsf{T} \\ \mathsf{a} \end{cases} \\ \text{bit}(\mathsf{l},\mathsf{i}) \begin{cases} \text{array-plus}(\text{array-remove}(\mathsf{i},\mathsf{a}^{\mathsf{h}},\mathsf{l}+1),\mathsf{a}^{\mathsf{t}}) \\ \text{array-plus}(\mathsf{a}^{\mathsf{h}},\text{array-remove}(\mathsf{i},\mathsf{a}^{\mathsf{t}},\mathsf{l}+1)) \end{cases} \end{cases} \end{cases} \quad]$$

$[\text{array-remove}(\mathsf{i},\mathsf{a},\mathsf{l}) \overset{\text{tex}}{\rightarrow} \text{“}$
array\mbox{-}\linebreak[0]remove(#1.
, #2.
, #3.
)”]

$[\text{array-remove}(\mathsf{i},\mathsf{a},\mathsf{l}) \overset{\text{pyk}}{\rightarrow} \text{“array remove } * \text{ array } * \text{ level } * \text{ end remove”}]$

array-put$(*, *, *, *)$

$$[\text{array-put}(\mathsf{i},\mathsf{v},\mathsf{a},\mathsf{l}) \overset{\text{val}}{\to} [\ [\ \mathsf{l}\ ]\ !\ [\ \mathsf{a}^{\mathrm{a}}\ ]\ ]\ \begin{cases} \mathsf{i} :: \mathsf{v} \\ \mathsf{a}^{\mathrm{hc}} \begin{cases} [\ \mathsf{a}^{\mathrm{h}} \approx \mathsf{i}\ ] \begin{cases} \mathsf{i} :: \mathsf{v} \\ \text{array-add}(\mathsf{i},\mathsf{v},\mathsf{a}^{\mathrm{h}},\mathsf{a}^{\mathrm{t}},\mathsf{l}) \end{cases} \\ \text{bit}(\mathsf{l},\mathsf{i}) \begin{cases} \text{array-put}(\mathsf{i},\mathsf{v},\mathsf{a}^{\mathrm{h}},\mathsf{l}+1) :: [\ \mathsf{a}^{\mathrm{t}}\ ] \\ \mathsf{a}^{\mathrm{h}} :: \text{array-put}(\mathsf{i},\mathsf{v},\mathsf{a}^{\mathrm{t}},\mathsf{l}+1) \end{cases} \end{cases} \end{cases}]$$

$$[\text{array-put}(\mathsf{i},\mathsf{v},\mathsf{a},\mathsf{l}) \overset{\text{tex}}{\to} \text{“}$$
array\mbox{-}\linebreak[0]put(#1.
, #2.
, #3.
, #4.
)”]

$$[\text{array-put}(\mathsf{i},\mathsf{v},\mathsf{a},\mathsf{l}) \overset{\text{pyk}}{\to} \text{“array put } * \text{ value } * \text{ array } * \text{ level } * \text{ end put”}]$$

array-add$(*, *, *, *, *)$

$$[\text{array-add}(\mathsf{i},\mathsf{v},\mathsf{i}',\mathsf{v}',\mathsf{l}) \overset{\text{val}}{\to} [\ \text{bit}(\mathsf{l},\mathsf{i})\ ]\ \begin{cases} \text{bit}(\mathsf{l},\mathsf{i}') \begin{cases} \text{array-add}(\mathsf{i},\mathsf{v},\mathsf{i}',\mathsf{v}',\mathsf{l}+1) :: \mathsf{T} \\ (\mathsf{i} :: \mathsf{v})^{\mathrm{M}} :: (\mathsf{i}' :: [\ \mathsf{v}'\ ])^{\mathrm{M}} \end{cases} \\ \text{bit}(\mathsf{l},\mathsf{i}') \begin{cases} (\mathsf{i}' :: [\ \mathsf{v}'\ ])^{\mathrm{M}} :: (\mathsf{i} :: \mathsf{v})^{\mathrm{M}} \\ \mathsf{T} :: \text{array-add}(\mathsf{i},\mathsf{v},\mathsf{i}',\mathsf{v}',\mathsf{l}+1) \end{cases} \end{cases}]$$

$$[\text{array-add}(\mathsf{i},\mathsf{v},\mathsf{i}',\mathsf{v}',\mathsf{l}) \overset{\text{tex}}{\to} \text{“}$$
array\mbox{-}\linebreak[0]add(#1.
, #2.
, #3.
, #4.
, #5.
)”]

$$[\text{array-add}(\mathsf{i},\mathsf{v},\mathsf{i}',\mathsf{v}',\mathsf{l}) \overset{\text{pyk}}{\to} \text{“array add } * \text{ value } * \text{ index } * \text{ value } * \text{ level } * \text{ end add”}]$$

bit$(*, *)$

$$[\text{bit}(\mathsf{x},\mathsf{y}) \overset{\text{val}}{\to} \text{If}(\mathsf{x}^{\mathrm{c}} \wedge [\ \mathsf{y}^{\mathrm{c}}\ ], \text{bit}_1(\mathsf{x},\mathsf{y}), \mathsf{T})]$$

$$[\text{bit}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$$
bit(#1.
, #2.
)”]

$[\mathrm{bit}(\mathsf{x},\mathsf{y}) \overset{\mathrm{pyk}}{\to} \text{“bit } * \text{ of } * \text{ end bit”}]$

$\mathrm{bit}_1(*,*)$

$[\mathrm{bit}_1(\mathsf{x},\mathsf{y}) \overset{\mathrm{val}}{\to} \mathrm{If}(\mathsf{x}^{\mathrm{s}},\mathsf{y}^{\mathrm{h}},\mathrm{bit}(\mathsf{x}-1,\mathsf{y}^{\mathrm{t}}))]$

$[\mathrm{bit}_1(\mathsf{x},\mathsf{y}) \overset{\mathrm{tex}}{\to} \text{“}$
bit_1(#1.
, #2.
)”]

$[\mathrm{bit}_1(\mathsf{x},\mathsf{y}) \overset{\mathrm{pyk}}{\to} \text{“bit one } * \text{ of } * \text{ end bit”}]$

rack

$[\mathrm{rack} \overset{\mathrm{val}}{\to} \mathrm{base}[\mathrm{base}[0]]]$

$[\mathrm{rack} \overset{\mathrm{tex}}{\to} \text{“}$
rack”]

$[\mathrm{rack} \overset{\mathrm{pyk}}{\to} \text{“example rack”}]$

"vector"

$[\text{"vector"} \overset{\mathrm{val}}{\to} \mathrm{identifier}(\lceil \text{“vector”} \rceil)]$

$[\text{"vector"} \overset{\mathrm{tex}}{\to} \text{“}$
\mbox {\tt \char34}\mathrm {vector}\mbox {\tt \char34}”]

$[\text{"vector"} \overset{\mathrm{pyk}}{\to} \text{“vector hook”}]$

"bibliography"

$[\text{"bibliography"} \overset{\mathrm{val}}{\to} \mathrm{identifier}(\lceil \text{“bibliography”} \rceil)]$

$[\text{"bibliography"} \overset{\mathrm{tex}}{\to} \text{“}$
\mbox {\tt \char34}\mathrm {bibliography}\mbox {\tt \char34}”]

$[\text{"bibliography"} \overset{\mathrm{pyk}}{\to} \text{“bibliography hook”}]$

"dictionary"

["dictionary" $\overset{\text{val}}{\to}$ identifier(⌈“dictionary”⌉)]

["dictionary" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {dictionary}\mbox {\tt \char34}”]

["dictionary" $\overset{\text{pyk}}{\to}$ “dictionary hook”]

"body"

["body" $\overset{\text{val}}{\to}$ identifier(⌈“body”⌉)]

["body" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {body}\mbox {\tt \char34}”]

["body" $\overset{\text{pyk}}{\to}$ “body hook”]

"codex"

["codex" $\overset{\text{val}}{\to}$ identifier(⌈“codex”⌉)]

["codex" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {codex}\mbox {\tt \char34}”]

["codex" $\overset{\text{pyk}}{\to}$ “codex hook”]

"expansion"

["expansion" $\overset{\text{val}}{\to}$ identifier(⌈“expansion”⌉)]

["expansion" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {expansion}\mbox {\tt \char34}”]

["expansion" $\overset{\text{pyk}}{\to}$ “expansion hook”]

"code"

["code" $\overset{\text{val}}{\to}$ identifier(⌈“code”⌉)]

["code" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {code}\mbox {\tt \char34}”]

["code" $\overset{\text{pyk}}{\to}$ “code hook”]

"cache"

["cache" $\overset{\text{val}}{\to}$ identifier(⌈“cache”⌉)]

["cache" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {cache}\mbox {\tt \char34}”]

["cache" $\overset{\text{pyk}}{\to}$ “cache hook”]

"diagnose"

["diagnose" $\overset{\text{val}}{\to}$ identifier(⌈“diagnose”⌉)]

["diagnose" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {diagnose}\mbox {\tt \char34}”]

["diagnose" $\overset{\text{pyk}}{\to}$ “diagnose hook”]

"pyk"

["pyk" $\overset{\text{val}}{\to}$ identifier(⌈“pyk”⌉)]

["pyk" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {pyk}\mbox {\tt \char34}”]

["pyk" $\overset{\text{pyk}}{\to}$ “pyk aspect”]

"tex"

["tex" $\overset{\text{val}}{\to}$ identifier(⌈“tex”⌉)]

["tex" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {tex}\mbox {\tt \char34}”]

["tex" $\overset{\text{pyk}}{\to}$ “tex aspect”]

"texname"

["texname" $\overset{\text{val}}{\to}$ identifier(⌈“texname”⌉)]

["texname" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {texname}\mbox {\tt \char34}”]

["texname" $\overset{\text{pyk}}{\to}$ “texname aspect”]

"value"

["value" $\overset{\text{val}}{\to}$ identifier(⌈“value”⌉)]

["value" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {value}\mbox {\tt \char34}”]

["value" $\overset{\text{pyk}}{\to}$ “value aspect”]

"message"

["message" $\overset{\text{val}}{\to}$ identifier(⌈“message”⌉)]

["message" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {message}\mbox {\tt \char34}”]

["message" $\overset{\text{pyk}}{\to}$ “message aspect”]

"macro"

["macro" $\overset{\text{val}}{\to}$ identifier(⌈“macro”⌉)]

["macro" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {macro}\mbox {\tt \char34}”]

["macro" $\overset{\text{pyk}}{\to}$ “macro aspect”]

"definition"

["definition" $\overset{\text{val}}{\to}$ identifier(⌈“definition”⌉)]

["definition" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {definition}\mbox {\tt \char34}”]

["definition" $\overset{\text{pyk}}{\to}$ “definition aspect”]

"unpack"

["unpack" $\overset{\text{val}}{\to}$ identifier(⌈"unpack"⌉)]

["unpack" $\overset{\text{tex}}{\to}$ "
\mbox {\tt \char34}\mathrm {unpack}\mbox {\tt \char34}"]

["unpack" $\overset{\text{pyk}}{\to}$ "unpack aspect"]

"claim"

["claim" $\overset{\text{val}}{\to}$ identifier(⌈"claim"⌉)]

["claim" $\overset{\text{tex}}{\to}$ "
\mbox {\tt \char34}\mathrm {claim}\mbox {\tt \char34}"]

["claim" $\overset{\text{pyk}}{\to}$ "claim aspect"]

"priority"

["priority" $\overset{\text{val}}{\to}$ identifier(⌈"priority"⌉)]

["priority" $\overset{\text{tex}}{\to}$ "
\mbox {\tt \char34}\mathrm {priority}\mbox {\tt \char34}"]

["priority" $\overset{\text{pyk}}{\to}$ "priority aspect"]

"lambda"

["lambda" $\overset{\text{val}}{\to}$ identifier(⌈"lambda"⌉)]

["lambda" $\overset{\text{tex}}{\to}$ "
\mbox {\tt \char34}\mathrm {lambda}\mbox {\tt \char34}"]

["lambda" $\overset{\text{pyk}}{\to}$ "lambda identifier"]

"apply"

["apply" $\overset{\text{val}}{\to}$ identifier(⌈"apply"⌉)]

["apply" $\overset{\text{tex}}{\to}$ "
\mbox {\tt \char34}\mathrm {apply}\mbox {\tt \char34}"]

["apply" $\overset{\text{pyk}}{\to}$ “apply identifier”]

"true"

["true" $\overset{\text{val}}{\to}$ identifier(⌈“true”⌉)]

["true" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {true}\mbox {\tt \char34}”]

["true" $\overset{\text{pyk}}{\to}$ “true identifier”]

"if"

["if" $\overset{\text{val}}{\to}$ identifier(⌈“if”⌉)]

["if" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {if}\mbox {\tt \char34}”]

["if" $\overset{\text{pyk}}{\to}$ “if identifier”]

"quote"

["quote" $\overset{\text{val}}{\to}$ identifier(⌈“quote”⌉)]

["quote" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {quote}\mbox {\tt \char34}”]

["quote" $\overset{\text{pyk}}{\to}$ “quote identifier”]

"proclaim"

["proclaim" $\overset{\text{val}}{\to}$ identifier(⌈“proclaim”⌉)]

["proclaim" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {proclaim}\mbox {\tt \char34}”]

["proclaim" $\overset{\text{pyk}}{\to}$ “proclaim identifier”]

"define"

["define" $\overset{\text{val}}{\to}$ identifier(⌈“define”⌉)]

["define" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {define}\mbox {\tt \char34}”]

["define" $\overset{\text{pyk}}{\to}$ “define identifier”]

"introduce"

["introduce" $\overset{\text{val}}{\to}$ identifier(⌈“introduce”⌉)]

["introduce" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {introduce}\mbox {\tt \char34}”]

["introduce" $\overset{\text{pyk}}{\to}$ “introduce identifier”]

"hide"

["hide" $\overset{\text{val}}{\to}$ identifier(⌈“hide”⌉)]

["hide" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {hide}\mbox {\tt \char34}”]

["hide" $\overset{\text{pyk}}{\to}$ “hide identifier”]

"pre"

["pre" $\overset{\text{val}}{\to}$ identifier(⌈“pre”⌉)]

["pre" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {pre}\mbox {\tt \char34}”]

["pre" $\overset{\text{pyk}}{\to}$ “pre identifier”]

"post"

["post" $\overset{\text{val}}{\to}$ identifier(⌈“post”⌉)]

["post" $\overset{\text{tex}}{\to}$ “
\mbox {\tt \char34}\mathrm {post}\mbox {\tt \char34}”]

["post" $\overset{\text{pyk}}{\to}$ “post identifier”]

$$\mathcal{E}(*,*,*)$$

$$[\mathcal{E}(\mathsf{t},\mathsf{s},\mathsf{c}) \overset{\text{val}}{\to} \mathcal{E}_2(\mathsf{t},\mathsf{t}^{\mathsf{r}},\mathsf{t}^{\mathsf{i}},\mathsf{s},\mathsf{c})]$$

$$[\mathcal{E}(*,*,*) \overset{\text{tex}}{\to} \text{“}$$
{\cal E}(#1.
,#2.
,#3.
)”]

$$[\mathcal{E}(*,*,*) \overset{\text{pyk}}{\to} \text{“eval } * \text{ stack } * \text{ cache } * \text{ end eval”}]$$

$$\mathcal{E}_2(*,*,*,*,*)$$

$$[\mathcal{E}_2(\mathsf{t},\mathsf{r},\mathsf{i},\mathsf{s},\mathsf{c}) \overset{\text{val}}{\to} \mathsf{i}^{\mathsf{s}} \left\{ \begin{array}{l} \mathsf{t}!\ [\ \mathsf{s}!\mathsf{If}(\mathsf{r} \approx\ [\ \mathsf{c}[0]\ ]\ ,\mathsf{c},\mathsf{c}[\mathsf{c}[0]][\text{"cache"}][\mathsf{r}])\ ] \\ \mathcal{E}_3(\mathsf{t},\mathsf{c}[\mathsf{r}][\text{"code"}][\mathsf{i}],\mathsf{s},\mathsf{c}) \end{array} \right.]$$

$$[\mathcal{E}_2(*,*,*,*,*) \overset{\text{tex}}{\to} \text{“}$$
{\cal E}_2(#1.
,#2.
,#3.
,#4.
,#5.
)”]

$$[\mathcal{E}_2(*,*,*,*,*) \overset{\text{pyk}}{\to} \text{“eval two } * \text{ ref } * \text{ id } * \text{ stack } * \text{ cache } * \text{ end eval”}]$$

$$\mathcal{E}_3(*,*,*,*)$$

$$[\mathcal{E}_3(\mathsf{t},\mathsf{f},\mathsf{s},\mathsf{c}) \overset{\text{val}}{\to} \mathsf{f}^{\mathsf{c}} \left\{ \begin{array}{ll} \mathsf{f}^{\mathsf{s}} \left\{ \begin{array}{l} \textbf{abstract}(\mathsf{t}^1,\mathsf{t}^2,\mathsf{s},\mathsf{c}) \\ \mathsf{c}!\ [\ \mathsf{s}!\ [\ \mathsf{t}^1\ ]\ ] \end{array} \right. & \\ \mathsf{f} \left\{ \begin{array}{l} \mathsf{c}!\textbf{lookup}(\mathsf{t},\mathsf{s},\mathsf{T}) \\ \mathcal{E}_4(\mathsf{f},\mathsf{t}^{\mathsf{t}},\mathsf{s},\mathsf{c}) \end{array} \right. & \end{array} \right.]$$

$$[\mathcal{E}_3(*,*,*,*) \overset{\text{tex}}{\to} \text{“}$$
{\cal E}_3(#1.
,#2.
,#3.
,#4.
)”]

$$[\mathcal{E}_3(*,*,*,*) \overset{\text{pyk}}{\to} \text{“eval three } * \text{ function } * \text{ stack } * \text{ cache } * \text{ end eval”}]$$

$\mathcal{E}_4(*,*,*,*)$

$[\mathcal{E}_4(\mathsf{f},\mathsf{a},\mathsf{s},\mathsf{c}) \overset{\text{val}}{\to} \mathrm{If}(\mathsf{a},\mathsf{s}!\ [\ \mathsf{c}!\mathsf{f}\ ]\ ,\mathcal{E}_4(\mathbf{apply}(\mathsf{f},\mathcal{E}(\mathsf{a}^{\mathrm{h}},\mathsf{s},\mathsf{c})),\mathsf{a}^{\mathrm{t}},\mathsf{s},\mathsf{c}))]$

$[\mathcal{E}_4(*,*,*,*) \overset{\text{tex}}{\to}$ “
{\cal E}_4(#1.
,#2.
,#3.
,#4.
)”]

$[\mathcal{E}_4(*,*,*,*) \overset{\text{pyk}}{\to}$ “eval four $*$ arguments $*$ stack $*$ cache $*$ end eval”]

$\mathbf{lookup}(*,*,*)$

$[\mathbf{lookup}(\mathsf{v},\mathsf{s},\mathsf{d}) \overset{\text{val}}{\to} \mathsf{v}!\ [\ \mathsf{d}!\mathrm{If}(\mathsf{s},\mathsf{d},\mathrm{If}(\mathsf{v} \overset{\mathrm{t}}{=}\ [\ \mathsf{s}^{\mathrm{hh}}\ ]\ ,\mathsf{s}^{\mathrm{ht}},\mathbf{lookup}(\mathsf{v},\mathsf{s}^{\mathrm{t}},\mathsf{d})))\ ]\ ]$

$[\mathbf{lookup}(*,*,*) \overset{\text{tex}}{\to}$ “
\mathbf {lookup}(#1.
,#2.
,#3.
)”]

$[\mathbf{lookup}(*,*,*) \overset{\text{pyk}}{\to}$ “lookup $*$ stack $*$ default $*$ end lookup”]

$\mathbf{abstract}(*,*,*,*)$

$[\mathbf{abstract}(\mathsf{v},\mathsf{t},\mathsf{s},\mathsf{c}) \overset{\text{val}}{\to} \mathsf{v}!\ [\ \mathsf{t}!\ [\ \mathsf{s}!\ [\ \mathsf{c}!\Lambda\lambda\mathsf{x}.\mathcal{E}(\mathsf{t},(\mathsf{v}::\mathsf{x})^{\mathrm{M}}::\mathsf{s},\mathsf{c})\ ]\ ]\ ]\ ]$

$[\mathbf{abstract}(*,*,*,*) \overset{\text{tex}}{\to}$ “
\mathbf {abstract}(#1.
,#2.
,#3.
,#4.
)”]

$[\mathbf{abstract}(*,*,*,*) \overset{\text{pyk}}{\to}$ “abstract $*$ term $*$ stack $*$ cache $*$ end abstract”]

$\lceil * \rceil$

Predef: quote

$[\lceil * \rceil \overset{\text{tex}}{\to}$ “

\lceil #1.
\rceil "]

$[\lceil * \rceil \overset{\text{pyk}}{\to} \text{“quote } * \text{ end quote”}]$

$\mathcal{M}(*, *, *)$

$[\mathcal{M}(\mathsf{t}, \mathsf{s}, \mathsf{c}) \overset{\text{val}}{\to} \mathsf{s}!\ [\ \mathsf{c}!\mathrm{If}(\mathsf{t}^{\mathrm{is}}, \mathsf{t}, \mathcal{M}_2(\mathsf{t}, \mathbf{aspect}(\texttt{"macro"}, \mathsf{t}, \mathsf{c}), \mathsf{s}, \mathsf{c}))\ ]\ ]$

$[\mathcal{M}(*, *, *) \overset{\text{tex}}{\to} \text{“}$
{\cal M}(#1.
,#2.
,#3.
)"]

$[\mathcal{M}(*, *, *) \overset{\text{pyk}}{\to} \text{“expand } * \text{ state } * \text{ cache } * \text{ end expand”}]$

$\mathcal{M}_2(*, *, *, *)$

$$[\mathcal{M}_2(\mathsf{t}, \mathsf{d}, \mathsf{s}, \mathsf{c}) \overset{\text{val}}{\to} \mathsf{d} \left\{ \begin{array}{l} \mathsf{t}^{\mathrm{h}} :: \mathcal{M}^*(\mathsf{t}^{\mathrm{t}}, \mathsf{s}, \mathsf{c}) \\ \mathcal{U}^{\mathrm{M}}(\ [\ [\ \mathcal{E}(\mathsf{d}^3, \mathsf{T}, \mathsf{c})\ \text{`}\,\mathsf{t}\ ]\ \text{`}\,\mathsf{s}\ ]\ \text{`}\,\mathsf{c}) \end{array} \right.]$$

$[\mathcal{M}_2(*, *, *, *) \overset{\text{tex}}{\to} \text{“}$
{\cal M}_2(#1.
,#2.
,#3.
,#4.
)"]

$[\mathcal{M}_2(*, *, *, *) \overset{\text{pyk}}{\to} \text{“expand two } * \text{ definition } * \text{ state } * \text{ cache } * \text{ end expand”}]$

$\mathcal{M}^*(*, *, *)$

$[\mathcal{M}^*(\mathsf{a}, \mathsf{s}, \mathsf{c}) \overset{\text{val}}{\to} \mathsf{s}!\ [\ \mathsf{c}!\mathrm{If}(\mathsf{a}, \mathsf{T}, \mathcal{M}(\mathsf{a}^{\mathrm{h}}, \mathsf{s}, \mathsf{c}) :: \mathcal{M}^*(\mathsf{a}^{\mathrm{t}}, \mathsf{s}, \mathsf{c}))\ ]\ ]$

$[\mathcal{M}^*(*, *, *) \overset{\text{tex}}{\to} \text{“}$
{\cal M}^*(#1.
,#2.
,#3.
)"]

$[\mathcal{M}^*(*, *, *) \overset{\text{pyk}}{\to} \text{“expand list } * \text{ state } * \text{ cache } * \text{ end expand”}]$

macro

Predef: macro
[macro $\overset{\text{tex}}{\to}$ “
\mathrm {macro}”]
[macro $\overset{\text{pyk}}{\to}$ “macro”]

S_0

[$\mathrm{s}_0 \overset{\text{val}}{\to} \mathcal{M}(\lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\mathcal{M}(\mathsf{t},\mathsf{s},\mathsf{c})) :: \mathsf{T}$]
[$\mathrm{s}_0 \overset{\text{tex}}{\to}$ “
s_0”]
[$\mathrm{s}_0 \overset{\text{pyk}}{\to}$ “macro state”]

$\mathbf{zip}(*,*)$

[$\mathbf{zip}(\mathsf{p},\mathsf{a}) \overset{\text{val}}{\to} \mathsf{a!If}(\mathsf{p},\mathsf{T},(\mathsf{p}^{\mathrm{h}} :: [\ \mathsf{a}^{\mathrm{h}}\ ])^{\mathrm{M}} :: \mathbf{zip}(\mathsf{p}^{\mathrm{t}},\mathsf{a}^{\mathrm{t}}))$]
[$\mathbf{zip}(*,*) \overset{\text{tex}}{\to}$ “
\mathbf {zip}(#1.
,#2.
)”]
[$\mathbf{zip}(*,*) \overset{\text{pyk}}{\to}$ “zip $*$ with $*$ end zip”]

$\mathbf{assoc}_1(*,*,*)$

$$[\mathbf{assoc}_1(\mathsf{a},\mathsf{d},\mathsf{i}) \overset{\text{val}}{\to} \mathsf{a}^{\mathrm{a}} \begin{cases} \mathsf{d}!\,[\ \mathsf{i}!\mathsf{T}\ ] \\ \mathsf{a}^{\mathrm{hc}} \begin{cases} [\ \mathsf{i} \approx\ [\ \mathsf{a}^{\mathrm{h}}\ ]\ ] \begin{cases} \mathsf{d}!\,[\ \mathsf{a}^{\mathrm{t}}\ ] \\ \mathsf{d}!\mathsf{T} \end{cases} \\ \mathsf{d}^{\mathrm{h}} \begin{cases} \mathbf{assoc}_1(\mathsf{a}^{\mathrm{h}},\mathsf{d}^{\mathrm{t}},\mathsf{i}) \\ \mathbf{assoc}_1(\mathsf{a}^{\mathrm{t}},\mathsf{d}^{\mathrm{t}},\mathsf{i}) \end{cases} \end{cases} \end{cases}]$$

[$\mathbf{assoc}_1(*,*,*) \overset{\text{tex}}{\to}$ “
\mathbf {assoc}_1(#1.
,#2.
,#3.
)”]
[$\mathbf{assoc}_1(*,*,*) \overset{\text{pyk}}{\to}$ “assoc one $*$ address $*$ index $*$ end assoc”]

$(*)^{\mathbf{p}}$

$[(\mathsf{x})^{\mathbf{p}} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\ [\ \mathsf{t}^{1}\ ]\ ]$

$[(*)^{\mathbf{p}} \overset{\text{tex}}{\to}$ “(#1.
)ˆ{\mathbf {p}}”]

$[(*)^{\mathbf{p}} \overset{\text{pyk}}{\to}$ “protect $*$ end protect”]

self

$[\text{self} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\ [\ (\mathsf{c}[0] ::\ [\ 0 ::\ [\ \mathsf{t}^{\mathrm{d}}\ ]\ ]\ )^{\mathrm{I}} ::\ \mathsf{T}\ ]\ ]$

$[\text{self} \overset{\text{pyk}}{\to}$ “self”]

$\left[* \mathrel{\ddot{=}} *\right]$

$[[\mathsf{x} \mathrel{\ddot{=}} \mathsf{y}] \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_3(\mathsf{t})]$

$[[* \mathrel{\ddot{=}} *] \overset{\text{tex}}{\to}$ “
[#1/tex name/tex.
\mathrel {\ddot {=}}#2.
]”]

$[[* \mathrel{\ddot{=}} *] \overset{\text{pyk}}{\to}$ macrodefine $*$ as $*$ enddefine]

$\left[* \mathrel{\dot{=}} *\right]$

$[[\mathsf{x} \mathrel{\dot{=}} \mathsf{y}] \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[[\mathsf{x} \mathrel{\dot{=}} \mathsf{y}] \mathrel{\ddot{=}} [(\mathsf{x})^{\mathbf{p}} \overset{\text{val}}{\to} \mathsf{y}]]\rceil)]$

$[[* \mathrel{\dot{=}} *] \overset{\text{tex}}{\to}$ “
[#1/tex name/tex.
\mathrel {\dot {=}}#2.
]”]

$[[* \mathrel{\dot{=}} *] \overset{\text{pyk}}{\to}$ “value define $*$ as $*$ end define”]

$\left[* \mathrel{\acute{=}} *\right]$

$[[\mathsf{x} \mathrel{\acute{=}} \mathsf{y}] \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[[\mathsf{x} \mathrel{\acute{=}} \mathsf{y}] \mathrel{\ddot{=}} [(\mathsf{x})^{\mathbf{p}} \overset{\text{val}}{\Rightarrow} \mathsf{y}]]\rceil)]$

$[[* \mathrel{\acute{=}} *] \overset{\text{tex}}{\to}$ “

[#1/tex name/tex.
\mathrel {\acute {=}}#2.
]”]

$[[* \stackrel{\acute{}}{=} *] \overset{\text{pyk}}{\rightarrow} \text{“intro define } * \text{ as } * \text{ end define”}]$

$\left[* \overset{\text{pyk}}{\stackrel{\cdot\cdot}{=}} *\right]$

$[[\mathsf{x} \overset{\text{pyk}}{=} \mathsf{y}] \overset{\text{macro}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[[\mathsf{x} \overset{\text{pyk}}{=} \mathsf{y}] \stackrel{\cdot\cdot}{=} [(\mathsf{x})^{\mathbf{p}} \overset{\text{pyk}}{\rightarrow} \mathsf{y}]]\rceil)]$

$[[* \overset{\text{pyk}}{=} *] \overset{\text{tex}}{\rightarrow} \text{“}$
[#1/tex name/tex.
\stackrel {\mathrm {pyk}}{=} #2/tex name.
]”]

$[[* \overset{\text{pyk}}{=} *] \overset{\text{pyk}}{\rightarrow} \text{“pyk define } * \text{ as } * \text{ end define”}]$

$\left[* \overset{\text{tex}}{=} *\right]$

$[[\mathsf{x} \overset{\text{tex}}{=} \mathsf{y}] \overset{\text{macro}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[[\mathsf{x} \overset{\text{tex}}{=} \mathsf{y}] \stackrel{\cdot\cdot}{=} [(\mathsf{x})^{\mathbf{p}} \overset{\text{tex}}{\rightarrow} \mathsf{y}]]\rceil)]$

$[[* \overset{\text{tex}}{=} *] \overset{\text{tex}}{\rightarrow} \text{“}$
[#1/tex name/tex.
\stackrel {\mathrm {tex}}{=} #2/tex name.
]”]

$[[* \overset{\text{tex}}{=} *] \overset{\text{pyk}}{\rightarrow} \text{“tex define } * \text{ as } * \text{ end define”}]$

$\left[* \overset{\text{name}}{=} *\right]$

$[[\mathsf{x} \overset{\text{name}}{=} \mathsf{y}] \overset{\text{macro}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[[\mathsf{x} \overset{\text{name}}{=} \mathsf{y}] \stackrel{\cdot\cdot}{=} [(\mathsf{x})^{\mathbf{p}} \overset{\text{name}}{\rightarrow} \mathsf{y}]]\rceil)]$

$[[* \overset{\text{name}}{=} *] \overset{\text{tex}}{\rightarrow} \text{“}$
[#1/tex name/tex.
\stackrel {\mathrm {name}}{=} #2/tex name.
]”]

$[[* \overset{\text{name}}{=} *] \overset{\text{pyk}}{\rightarrow} \text{“tex name define } * \text{ as } * \text{ end define”}]$

Priority table$[*]$

$[\textbf{Priority table}[\mathsf{x}] \overset{\text{name}}{\to} \text{“}$
\mathbf{Priority\ table} [#1.
]”]

$[\textbf{Priority table}[\mathsf{x}] \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\textbf{Priority table}[\mathsf{x}] \doteqdot [\text{self} \overset{\text{prio}}{\to} (\mathsf{x})^{\mathbf{P}}]]\rceil)]$

$[\textbf{Priority table}[\mathsf{x}] \overset{\text{tex}}{\to} \text{“}$
\mathbf{Priority\ table} #1.
\mathbf{End\ table}”]

$[\textbf{Priority table}[\mathsf{x}] \overset{\text{pyk}}{\to} \text{“priority table} * \text{end table”}]$

$\tilde{\mathcal{M}}_1$

$[\tilde{\mathcal{M}}_1 \overset{\text{val}}{\to} \lceil[\mathsf{x} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil\mathsf{d}\rceil)]\rceil]$

$[\tilde{\mathcal{M}}_1 \overset{\text{tex}}{\to} \text{“}$
\tilde {{\cal M}}_1”]

$[\tilde{\mathcal{M}}_1 \overset{\text{pyk}}{\to} \text{“macro define one”}]$

$\tilde{\mathcal{M}}_2(*)$

$[\tilde{\mathcal{M}}_2(\mathsf{t}) \overset{\text{val}}{\to} (\lceil\mathsf{x}\rceil :: [\ \mathsf{t}^1\ ])^{\mathrm{M}} :: [\ (\lceil\mathsf{d}\rceil :: \mathsf{t})^{\mathrm{M}} :: \mathsf{T}\ ]\ ]$

$[\tilde{\mathcal{M}}_2(*) \overset{\text{tex}}{\to} \text{“}$
\tilde {{\cal M}}_2(#1.
)”]

$[\tilde{\mathcal{M}}_2(*) \overset{\text{pyk}}{\to} \text{“macro define two} * \text{end define”}]$

$\tilde{\mathcal{M}}_3(*)$

$[\tilde{\mathcal{M}}_3(\mathsf{t}) \overset{\text{val}}{\to} \tilde{\mathcal{Q}}(\mathsf{t},\tilde{\mathcal{M}}_1,\tilde{\mathcal{M}}_2(\mathsf{t}))]$

$[\tilde{\mathcal{M}}_3(*) \overset{\text{tex}}{\to} \text{“}$
\tilde {{\cal M}}_3(#1.
)”]

$[\tilde{\mathcal{M}}_3(*) \overset{\text{pyk}}{\to} \text{“macro define three} * \text{end define”}]$

$\tilde{\mathcal{M}}_4(*,*,*,*)$

$[\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\mathsf{d}) \overset{\text{val}}{\to} \tilde{\mathcal{M}}(\tilde{\mathcal{Q}}(\mathsf{t},\mathsf{d}^2,\mathbf{zip}(\mathsf{d}^{1\mathsf{t}},\mathsf{t}^{\mathsf{t}})),\mathsf{s},\mathsf{c})]$

$[\tilde{\mathcal{M}}_4(*,*,*,*) \overset{\text{tex}}{\to}$ “
\tilde {{\cal M}}_4(#1.
,#2.
,#3.
,#4.
)”]

$[\tilde{\mathcal{M}}_4(*,*,*,*) \overset{\text{pyk}}{\to}$ “macro define four ∗ state ∗ cache ∗ definition ∗ end define”]

$\tilde{\mathcal{M}}(*,*,*)$

$[\tilde{\mathcal{M}}(\mathsf{t},\mathsf{s},\mathsf{c}) \overset{\text{val}}{\to} \mathcal{U}(\ [\ [\ \mathsf{s}^{\mathsf{h}}\ \text{‘}\ \mathsf{t}\ ]\ \text{‘}\ \mathsf{s}\ ]\ \text{‘}\ \mathsf{c})]$

$[\tilde{\mathcal{M}}(*,*,*) \overset{\text{tex}}{\to}$ “
\tilde {{\cal M}}(#1.
,#2.
,#3.
)”]

$[\tilde{\mathcal{M}}(*,*,*) \overset{\text{pyk}}{\to}$ “state expand ∗ state ∗ cache ∗ end expand”]

$\tilde{\mathcal{Q}}(*,*,*)$

$[\tilde{\mathcal{Q}}(\mathsf{r},\mathsf{t},\mathsf{s}) \overset{\text{val}}{\to} \tilde{\mathcal{Q}}_2(\mathsf{r}^{\mathsf{d}},\mathsf{t},\mathsf{s})]$

$[\tilde{\mathcal{Q}}(*,*,*) \overset{\text{tex}}{\to}$ “
\tilde {{\cal Q}}(#1.
,#2.
,#3.
)”]

$[\tilde{\mathcal{Q}}(*,*,*) \overset{\text{pyk}}{\to}$ “quote expand ∗ term ∗ stack ∗ end expand”]

$\tilde{\mathcal{Q}}_2(*,*,*)$

$[\tilde{\mathcal{Q}}_2(\mathsf{r},\mathsf{t},\mathsf{s}) \overset{\text{val}}{\to} \tilde{\mathcal{Q}}_3(\mathsf{r},\mathsf{t},\mathsf{s},\mathbf{lookup}(\mathsf{t},\mathsf{s},\mathsf{T}))]$

$[\tilde{\mathcal{Q}}_2(*,*,*) \overset{\text{tex}}{\to}$ “
\tilde {{\cal Q}}_2(#1.

,#2.
,#3.
)"]

$[\tilde{\mathcal{Q}}_2(*,*,*) \overset{\text{pyk}}{\to}$ "quote expand two $*$ term $*$ stack $*$ end expand"$]$

$\tilde{\mathcal{Q}}_3(*,*,*,*)$

$[\tilde{\mathcal{Q}}_3(\mathsf{r},\mathsf{t},\mathsf{s},\mathsf{v}) \overset{\text{val}}{\to} \mathsf{v} \left\{ \begin{array}{l} (\mathsf{t}^{\mathsf{r}} :: [\ \mathsf{t}^{\mathsf{i}} :: \mathsf{r}\ ])^{\mathrm{M}} :: \tilde{\mathcal{Q}}^*(\mathsf{r},\mathsf{t}^{\mathsf{t}},\mathsf{s}) \\ \mathsf{r}!\ [\ \mathsf{t}!\ [\ \mathsf{s}!\mathsf{v}\ ]\ ] \end{array} \right.]$

$[\tilde{\mathcal{Q}}_3(*,*,*,*) \overset{\text{tex}}{\to}$ "
\tilde {{\cal Q}}_3(#1.
,#2.
,#3.
,#4.
)"]

$[\tilde{\mathcal{Q}}_3(*,*,*,*) \overset{\text{pyk}}{\to}$ "quote expand three $*$ term $*$ stack $*$ value $*$ end expand"$]$

$\tilde{\mathcal{Q}}^*(*,*,*)$

$[\tilde{\mathcal{Q}}^*(\mathsf{r},\mathsf{t},\mathsf{s}) \overset{\text{val}}{\to} \mathsf{t} \left\{ \begin{array}{l} \mathsf{r}!\ [\ \mathsf{t}!\ [\ \mathsf{s}!\mathsf{T}\ ]\ ] \\ \tilde{\mathcal{Q}}_2(\mathsf{r},\mathsf{t}^{\mathsf{h}},\mathsf{s}) :: \tilde{\mathcal{Q}}^*(\mathsf{r},\mathsf{t}^{\mathsf{t}},\mathsf{s}) \end{array} \right.]$

$[\tilde{\mathcal{Q}}^*(*,*,*) \overset{\text{tex}}{\to}$ "
\tilde {{\cal Q}}^*(#1.
,#2.
,#3.
)"]

$[\tilde{\mathcal{Q}}^*(*,*,*) \overset{\text{pyk}}{\to}$ "quote expand star $*$ term $*$ stack $*$ end expand"$]$

$(*)$

$[(\mathsf{x}) \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[(\mathsf{x}) \doteqdot \mathsf{x}]\rceil)]$

$[(*) \overset{\text{tex}}{\to}$ "
(#1.
)"]

$[(*) \overset{\text{pyk}}{\to}$ "parenthesis $*$ end parenthesis"$]$

$\mathbf{aspect}(*,*)$

$[\mathbf{aspect}(\mathsf{a},\mathsf{c}) \overset{\text{val}}{\to} \mathsf{a}^{\mathsf{c}} \begin{cases} \mathsf{c}[0][\mathsf{a}] \\ \mathsf{c}[\mathsf{a}^{\mathsf{r}}][\mathsf{a}^{\mathsf{i}}] \end{cases}]$

$[\mathbf{aspect}(\mathsf{a},\mathsf{c}) \overset{\text{tex}}{\to}$ “
\mathbf{aspect}(#1.
, #2.
)”]

$[\mathbf{aspect}(\mathsf{a},\mathsf{c}) \overset{\text{pyk}}{\to}$ “aspect $*$ subcodex $*$ end aspect”]

$\mathbf{aspect}(*,*,*)$

$[\mathbf{aspect}(\mathsf{a},\mathsf{t},\mathsf{c}) \overset{\text{val}}{\to} \mathbf{aspect}(\mathsf{a},\mathsf{c}[\mathsf{t}^{\mathsf{r}}][\text{"codex"}][\mathsf{t}^{\mathsf{r}}][\mathsf{t}^{\mathsf{i}}])]$

$[\mathbf{aspect}(*,*,*) \overset{\text{tex}}{\to}$ “
\mathbf{aspect}(#1.
, #2.
, #3.
)”]

$[\mathbf{aspect}(\mathsf{a},\mathsf{t},\mathsf{c}) \overset{\text{pyk}}{\to}$ “aspect $*$ term $*$ cache $*$ end aspect”]

$\langle * \rangle$

$[\langle \mathsf{x} \rangle \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}(\mathbf{tuple}_1(\mathsf{t}),\mathsf{s},\mathsf{c})]$

$[\langle * \rangle \overset{\text{tex}}{\to}$ “
\langle #1.
\rangle ”]

$[\langle \mathsf{x} \rangle \overset{\text{pyk}}{\to}$ “tuple $*$ end tuple”]

$\mathbf{tuple}_1(*)$

$[\mathbf{tuple}_1(\mathsf{t}) \overset{\text{val}}{\to} [\ \mathsf{t}^1 \overset{\text{r}}{=} \lceil \mathsf{x},\mathsf{y} \rceil\ ] \begin{cases} \tilde{\mathcal{Q}}(\mathsf{t},\lceil \mathsf{x} :: \langle \mathsf{y} \rangle \rceil, \mathbf{tuple}_2(\mathsf{t}^1)) \\ \tilde{\mathcal{Q}}(\mathsf{t},\lceil \mathsf{x} :: \mathsf{T} \rceil,\ [\ \lceil \mathsf{x} \rceil :: [\ \mathsf{t}^1\ ]\ ]\ :: \mathsf{T}) \end{cases}]$

$[\mathbf{tuple}_1(*) \overset{\text{tex}}{\to}$ “
\mathbf {tuple}_1(#1.
) ”]

$[\mathbf{tuple}_1(\mathsf{t}) \overset{\text{pyk}}{\to}$ “tuple one $*$ end tuple”]

$\mathbf{tuple}_2(*)$

$[\mathbf{tuple}_2(\mathsf{t}) \overset{\text{val}}{\to} [\ \lceil \mathsf{x} \rceil :: [\ \mathsf{t}^1\ ]\ ] :: [\ [\ \lceil \mathsf{y} \rceil :: [\ \mathsf{t}^2\ ]\ ] :: \mathsf{T}\ ]]$

$[\mathbf{tuple}_2(*) \overset{\text{tex}}{\to}$ “
\mathbf {tuple}_2(#1.
) ”]

$[\mathbf{tuple}_2(\mathsf{t}) \overset{\text{pyk}}{\to}$ “tuple two $*$ end tuple”]

$\mathrm{let}_2(*, *)$

$[\mathrm{let}_2(\mathsf{f}, \mathsf{y}) \overset{\text{val}}{\to} (\mathsf{y}!\ [\ \mathsf{f}\ '\ \mathsf{y}\ ]\ )^{\mathrm{I}}]$

$[\mathrm{let}_2(\mathsf{f}, \mathsf{y}) \overset{\text{tex}}{\to}$ “
let_2(#1.
, #2.
)”]

$[\mathrm{let}_2(\mathsf{f}, \mathsf{y}) \overset{\text{pyk}}{\to}$ “let two $*$ apply $*$ end let”]

$\mathrm{let}_1(*, *)$

$[\mathrm{let}_1(\mathsf{f}, \mathsf{y}) \overset{\text{val}}{\Rightarrow} \mathrm{let}_2(\mathsf{f}, \mathsf{y}^{\mathrm{M}})^{\mathrm{M}}]$

$[\mathrm{let}_1(\mathsf{f}, \mathsf{y}) \overset{\text{tex}}{\to}$ “
let_1(#1.
, #2.
)”]

$[\mathrm{let}_1(\mathsf{f}, \mathsf{y}) \overset{\text{pyk}}{\to}$ “let one $*$ apply $*$ end let”]

$\left[* \overset{\text{claim}}{=\!=} *\right]$

$[[\mathsf{x} \overset{\text{claim}}{=\!=} \mathsf{y}] \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[[\mathsf{x} \overset{\text{claim}}{=\!=} \mathsf{y}] \doteq [\mathsf{x} \overset{\text{claim}}{\to} \mathsf{y}]]\rceil)]$

$[[* \overset{\text{claim}}{=\!=} *] \overset{\text{tex}}{\to}$ “
[#1/tex name/tex.
\stackrel {claim}{=}#2.
]”]

$[[\mathsf{x} \overset{\text{claim}}{=\!=} \mathsf{y}] \overset{\text{pyk}}{\to}$ “claim define $*$ as $*$ end define”]

checker

$[\text{checker} \overset{\text{val}}{\to} \lambda \mathsf{t}.\lambda \mathsf{c}.\mathbf{check}(\mathsf{t},\mathsf{c})]$

$[\text{checker} \overset{\text{pyk}}{\to} \text{“checker”}]$

$\mathbf{check}(*,*)$

$[\mathbf{check}(\mathsf{t},\mathsf{c}) \overset{\text{val}}{\to} \mathrm{If}(\mathsf{t}^{\mathrm{is}}, \mathsf{c}!\mathsf{T}, \mathbf{check}_2(\mathsf{t},\mathsf{c},\mathbf{aspect}(\texttt{"claim"},\mathsf{t},\mathsf{c})))]$

$[\mathbf{check}(*,*) \overset{\text{tex}}{\to} \text{“}$
\mathbf{check}(#1.
, #2.
)”]

$[\mathbf{check}(\mathsf{t},\mathsf{c}) \overset{\text{pyk}}{\to} \text{“check} * \text{cache} * \text{end check”}]$

$\mathbf{check}_2(*,*,*)$

$[\mathbf{check}_2(\mathsf{t},\mathsf{c},\mathsf{d}) \overset{\text{val}}{\to} \mathsf{d} \begin{cases} \mathbf{check}_3(\mathsf{t},\mathsf{c},\mathbf{aspect}(\texttt{"definition"},\mathsf{t},\mathsf{c})) \\ \mathcal{U}^{\mathrm{M}}(\ [\ \mathcal{E}(\mathsf{d}^3,\mathsf{T},\mathsf{c})\ \text{‘}\ \mathsf{t}\ ]\ \text{‘}\ \mathsf{c}) \end{cases}\ ]$

$[\mathbf{check}_2(*,*,*) \overset{\text{tex}}{\to} \text{“}$
\mathbf{check}_2(#1.
, #2.
, #3.
)”]

$[\mathbf{check}_2(\mathsf{t},\mathsf{c},\mathsf{d}) \overset{\text{pyk}}{\to} \text{“check two} * \text{cache} * \text{def} * \text{end check”}]$

$\mathbf{check}_3(*,*,*)$

$[\mathbf{check}_3(\mathsf{t},\mathsf{c},\mathsf{d}) \overset{\text{val}}{\to} \mathrm{If}(\mathsf{d}, \mathbf{check}^*(\mathsf{t}^{\mathsf{t}},\mathsf{c}), \mathsf{t}!\ [\ \mathsf{c}!\mathsf{T}\ ]\ )]$

$[\mathbf{check}_3(*,*,*) \overset{\text{tex}}{\to} \text{“}$
\mathbf{check}_3(#1.
, #2.
, #3.
)”]

$[\mathbf{check}_3(\mathsf{t},\mathsf{c},\mathsf{d}) \overset{\text{pyk}}{\to} \text{“check three} * \text{cache} * \text{def} * \text{end check”}]$

$\mathbf{check}^{*}(*, *)$

$[\mathbf{check}^{*}(\mathsf{t}, \mathsf{c}) \overset{\text{val}}{\rightarrow} \mathrm{If}(\mathsf{t}, \mathsf{c}!\mathsf{T}, \mathbf{check}_2^{*}(\mathsf{t}^{\mathsf{t}}, \mathsf{c}, \mathbf{check}(\mathsf{t}^{\mathsf{h}}, \mathsf{c})))]$

$[\mathbf{check}^{*}(*, *) \overset{\text{tex}}{\rightarrow} \text{“}$
$\backslash\mathrm{mathbf}\{\mathrm{check}\}\hat{}*(\ \#1.$
$,\ \#2.$
$)\text{”}]$

$[\mathbf{check}^{*}(\mathsf{t}, \mathsf{c}) \overset{\text{pyk}}{\rightarrow} \text{“check list } * \text{ cache } * \text{ end check”}]$

$\mathbf{check}_2^{*}(*, *, *)$

$[\mathbf{check}_2^{*}(\mathsf{t}, \mathsf{c}, \mathsf{v}) \overset{\text{val}}{\rightarrow} \mathrm{If}(\neg\mathsf{v}, \mathsf{t}!\ [\ \mathsf{c}!\mathsf{v}\ ]\ , \mathbf{check}^{*}(\mathsf{t}, \mathsf{c}))]$

$[\mathbf{check}_2^{*}(*, *, *) \overset{\text{tex}}{\rightarrow} \text{“}$
$\backslash\mathrm{mathbf}\{\mathrm{check}\}\hat{}*\_2(\ \#1.$
$,\ \#2.$
$,\ \#3.$
$)\text{”}]$

$[\mathbf{check}_2^{*}(\mathsf{t}, \mathsf{c}, \mathsf{v}) \overset{\text{pyk}}{\rightarrow} \text{“check list two } * \text{ cache } * \text{ value } * \text{ end check”}]$

$\left[*\right]^{\cdot}$

$[[\mathsf{t}]^{\cdot} \overset{\text{claim}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{c}.\mathrm{if}(\mathcal{U}(\mathcal{E}(\mathsf{t}^1, \mathsf{T}, \mathsf{c})), \mathsf{T}, \mathsf{t})]$

$[[*]^{\cdot} \overset{\text{tex}}{\rightarrow} \text{“}$
$\backslash\mathrm{relax}\ [\ \#1.$
$\backslash\mathrm{relax}\ ]\hat{}\{\backslash\mathrm{cdot}\}\ \text{”}]$

$[[\mathsf{t}]^{\cdot} \overset{\text{pyk}}{\rightarrow} \text{“test } * \text{ end test”}]$

$\left[*\right]^{-}$

$[[\mathsf{x}]^{-} \overset{\text{claim}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{c}.\mathrm{if}(\mathcal{U}(\mathcal{E}(\mathsf{t}^1, \mathsf{T}, \mathsf{c})), \mathsf{t}, \mathsf{T})]$

$[[\mathsf{x}]^{-} \overset{\text{tex}}{\rightarrow} \text{“}$
$\backslash\mathrm{relax}\ [\ \#1.$
$\backslash\mathrm{relax}\ ]\hat{}\{\text{-}\}\ \text{”}]$

$[[\mathsf{x}]^{-} \overset{\text{pyk}}{\rightarrow} \text{“false test } * \text{ end test”}]$

$\lceil * \rceil^{\circ}$

$[[\mathsf{t}]^{\circ} \overset{\text{claim}}{\to} \lambda \mathsf{t}.\lambda \mathsf{c}.\mathcal{U}(\mathcal{E}(\mathsf{t}^1, \mathsf{T}, \mathsf{c}))]$

$[[*]^{\circ} \overset{\text{tex}}{\to}$ “
\relax [#1.
\relax]ˆ{\circ} ”]

$[[\mathsf{t}]^{\circ} \overset{\text{pyk}}{\to}$ “raw test $*$ end test”]

msg

Predef: message

[msg $\overset{\text{tex}}{\to}$ “
msg”]

[msg $\overset{\text{pyk}}{\to}$ “message”]

$\lceil * \overset{\text{msg}}{=} * \rceil$

$[[\mathsf{x} \overset{\text{msg}}{=} \mathsf{y}] \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil [[\mathsf{x} \overset{\text{msg}}{=} \mathsf{y}] \doteqdot [(\mathsf{x})^{\mathbf{p}} \overset{\text{msg}}{\to} \mathsf{y}]] \rceil)]$

$[[\mathsf{x} \overset{\text{msg}}{=} \mathsf{y}] \overset{\text{tex}}{\to}$ “
[#1/tex name/tex.
\stackrel {msg}{=} #2.
]”]

$[[\mathsf{x} \overset{\text{msg}}{=} \mathsf{y}] \overset{\text{pyk}}{\to}$ “message define $*$ as $*$ end define”]

<stmt>

[<stmt> $\overset{\text{val}}{\to} \lceil$<stmt>$\rceil$]

[<stmt> $\overset{\text{tex}}{\to}$ “
{<}stmt{>}”]

[<stmt> $\overset{\text{pyk}}{\to}$ “the statement aspect”]

stmt

[stmt $\overset{\text{msg}}{\to}$ <stmt>]

$[\mathrm{stmt} \overset{\mathrm{tex}}{\to} \text{“}$
$\mathrm{stmt}\text{”}]$

$[\mathrm{stmt} \overset{\mathrm{pyk}}{\to} \text{“statement”}]$

$\left[* \overset{\mathrm{stmt}}{=\!=} *\right]$

$[[\mathsf{x} \overset{\mathrm{stmt}}{=\!=} \mathsf{y}] \overset{\mathrm{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[[\mathsf{x} \overset{\mathrm{stmt}}{=\!=} \mathsf{y}] \doteqdot [(\mathsf{x})^{\mathbf{P}} \overset{\mathrm{stmt}}{\to} \mathsf{y}]]\urcorner)]$

$[[\mathsf{x} \overset{\mathrm{stmt}}{=\!=} \mathsf{y}] \overset{\mathrm{tex}}{\to} \text{“}$
$[\#1/\text{tex name/tex.}$
$\backslash\text{stackrel } \{\text{stmt}\}\{=\}\#2.$
$]\text{”}]$

$[[\mathsf{x} \overset{\mathrm{stmt}}{=\!=} \mathsf{y}] \overset{\mathrm{pyk}}{\to} \text{“statement define } * \text{ as } * \text{ end define”}]$

HeadNil′

$[\mathrm{HeadNil}' \overset{\mathrm{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathrm{HeadNil}' \doteqdot \mathsf{T}^{\mathrm{h}} = \mathsf{T}]\urcorner)]$

$[\mathrm{HeadNil}' \overset{\mathrm{tex}}{\to} \text{“}$
$\mathrm{HeadNil}\text{”}]$

$[\mathrm{HeadNil}' \overset{\mathrm{pyk}}{\to} \text{“example axiom”}]$

HeadPair′

$[\mathrm{HeadPair}' \overset{\mathrm{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathrm{HeadPair}' \doteqdot \forall\mathcal{A}{:}\forall\mathcal{B}{:}\ [\ (\mathcal{A} :: \mathcal{B})^{\mathrm{h}} = \mathcal{A}\ ]\urcorner)]$

$[\mathrm{HeadPair}' \overset{\mathrm{tex}}{\to} \text{“}$
$\mathrm{HeadPair}\text{”}]$

$[\mathrm{HeadPair}' \overset{\mathrm{pyk}}{\to} \text{“example scheme”}]$

Transitivity′

$[\mathrm{Transitivity}' \overset{\mathrm{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathrm{Transitivity}' \doteqdot \forall\mathcal{A}{:}\forall\mathcal{B}{:}\forall\mathcal{C}{:}\ [\ [\ \mathcal{A} = \mathcal{B}\ ] \vdash [\ [\ \mathcal{A} = \mathcal{C}\ ] \vdash [\ \mathcal{B} = \mathcal{C}\ ]\ ]\ ]\urcorner)]$

$[\mathrm{Transitivity}' \overset{\mathrm{tex}}{\to} \text{“}$
$\mathrm{Transitivity}\text{”}]$

$[\mathrm{Transitivity}' \overset{\mathrm{pyk}}{\to} \text{“example rule”}]$

$\perp\!\!\!\perp$

$[\perp\!\!\!\perp \overset{\text{val}}{\to} \lceil \perp\!\!\!\perp \rceil^{\mathrm{R}} :: \mathsf{T}]$

$[\perp\!\!\!\perp \overset{\text{tex}}{\to} \text{“}$
{\makebox [0mm][l]{$\bot $}\,{\bot }}”]

$[\perp\!\!\!\perp \overset{\text{pyk}}{\to} \text{“absurdity”}]$

Contra′

$[\text{Contra}' \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil [\text{Contra}' \doteqdot [\ [\ \mathsf{T} :: \mathsf{T}\ ] = \mathsf{T}\ ] \vdash \perp\!\!\!\perp] \rceil)]$

$[\text{Contra}' \overset{\text{tex}}{\to} \text{“}$
Contra”’]

$[\text{Contra}' \overset{\text{pyk}}{\to} \text{“contraexample”}]$

T'_{E}

$[\mathrm{T}'_{\mathrm{E}} \overset{\text{stmt}}{\to} [\ \mathsf{T}^{\mathrm{h}} = \mathsf{T}\ ] \oplus [\ [\ \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon [\ [\ \underline{\mathsf{a}} :: \underline{\mathsf{b}}\ ]^{\ \mathrm{h}} = \underline{\mathsf{a}}\ ]\ ] \oplus [\ [\ \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon \forall \underline{\mathsf{c}}\colon [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ] \vdash [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{c}}\ ] \vdash [\ \underline{\mathsf{b}} = \underline{\mathsf{c}}\ ]\ ]\ ]\ ] \oplus [\ [\ [\ \mathsf{T} :: \mathsf{T}\ ] = \mathsf{T}\ ] \vdash \perp\!\!\!\perp\ ]\ ]\ ]\ ]$

$[\mathrm{T}'_{\mathrm{E}} \overset{\text{tex}}{\to} \text{“}$
T’_{E}”]

$[\mathrm{T}'_{\mathrm{E}} \overset{\text{pyk}}{\to} \text{“example theory primed”}]$

L_1

$[\mathrm{L}_1 \overset{\text{stmt}}{\to} \mathrm{T}'_{\mathrm{E}} \vdash \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ] \vdash [\ \underline{\mathsf{b}} = \underline{\mathsf{a}}\ ]\ ]\ ]$

$[\mathrm{L}_1 \overset{\text{tex}}{\to} \text{“}$
L_{1}”]

$[\mathrm{L}_1 \overset{\text{pyk}}{\to} \text{“example lemma”}]$

$\underline{*}$

$[\underline{\mathsf{x}} \overset{\text{tex}}{\to} \text{“\underline{\#1.}”}]$

$[\underline{\mathsf{x}} \overset{\text{pyk}}{\to} \text{“metavar } * \text{ end metavar”}]$

$\mathcal{A}$

$[\mathcal{A} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{A} \doteq \underline{\mathsf{a}}]\rceil)]$

$[\mathcal{A} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal A\}”}]$

$[\mathcal{A} \overset{\text{pyk}}{\to} \text{“meta a”}]$

$\mathcal{B}$

$[\mathcal{B} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{B} \doteq \underline{\mathsf{b}}]\rceil)]$

$[\mathcal{B} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal B\}”}]$

$[\mathcal{B} \overset{\text{pyk}}{\to} \text{“meta b”}]$

$\mathcal{C}$

$[\mathcal{C} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{C} \doteq \underline{\mathsf{c}}]\rceil)]$

$[\mathcal{C} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal C\}”}]$

$[\mathcal{C} \overset{\text{pyk}}{\to} \text{“meta c”}]$

$\mathcal{D}$

$[\mathcal{D} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{D} \doteq \underline{\mathsf{d}}]\rceil)]$

$[\mathcal{D} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal D\}”}]$

$[\mathcal{D} \overset{\text{pyk}}{\to} \text{“meta d”}]$

$\mathcal{E}$

$[\mathcal{E} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{E} \doteq \underline{\mathsf{e}}]\rceil)]$

$[\mathcal{E} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal E\}”}]$

$[\mathcal{E} \overset{\text{pyk}}{\to} \text{“meta e”}]$

$\mathcal{F}$

$[\mathcal{F} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{F} \doteq \underline{\mathsf{f}}]\rceil)]$

$[\mathcal{F} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal F\}”}]$

$[\mathcal{F} \overset{\text{pyk}}{\to} \text{“meta f”}]$

$\mathcal{G}$

$[\mathcal{G} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathcal{G} \doteqdot \underline{\mathsf{g}}]\urcorner)]$

$[\mathcal{G} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal G\}”}]$

$[\mathcal{G} \overset{\text{pyk}}{\to} \text{“meta g”}]$

$\mathcal{H}$

$[\mathcal{H} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathcal{H} \doteqdot \underline{\mathsf{h}}]\urcorner)]$

$[\mathcal{H} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal H\}”}]$

$[\mathcal{H} \overset{\text{pyk}}{\to} \text{“meta h”}]$

$\mathcal{I}$

$[\mathcal{I} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathcal{I} \doteqdot \underline{\mathsf{i}}]\urcorner)]$

$[\mathcal{I} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal I\}”}]$

$[\mathcal{I} \overset{\text{pyk}}{\to} \text{“meta i”}]$

$\mathcal{J}$

$[\mathcal{J} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathcal{J} \doteqdot \underline{\mathsf{j}}]\urcorner)]$

$[\mathcal{J} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal J\}”}]$

$[\mathcal{J} \overset{\text{pyk}}{\to} \text{“meta j”}]$

$\mathcal{K}$

$[\mathcal{K} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathcal{K} \doteqdot \underline{\mathsf{k}}]\urcorner)]$

$[\mathcal{K} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal K\}”}]$

$[\mathcal{K} \overset{\text{pyk}}{\to} \text{“meta k”}]$

$\mathcal{L}$

$[\mathcal{L} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{L} \doteqdot \underline{\mathsf{l}}]\rceil)]$

$[\mathcal{L} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal L\}”}]$

$[\mathcal{L} \overset{\text{pyk}}{\to} \text{“meta l”}]$

$\mathcal{M}$

$[\mathcal{M} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{M} \doteqdot \underline{\mathsf{m}}]\rceil)]$

$[\mathcal{M} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal M\}”}]$

$[\mathcal{M} \overset{\text{pyk}}{\to} \text{“meta m”}]$

$\mathcal{N}$

$[\mathcal{N} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{N} \doteqdot \underline{\mathsf{n}}]\rceil)]$

$[\mathcal{N} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal N\}”}]$

$[\mathcal{N} \overset{\text{pyk}}{\to} \text{“meta n”}]$

$\mathcal{O}$

$[\mathcal{O} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{O} \doteqdot \underline{\mathsf{o}}]\rceil)]$

$[\mathcal{O} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal O\}”}]$

$[\mathcal{O} \overset{\text{pyk}}{\to} \text{“meta o”}]$

$\mathcal{P}$

$[\mathcal{P} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{P} \doteqdot \underline{\mathsf{p}}]\rceil)]$

$[\mathcal{P} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal P\}”}]$

$[\mathcal{P} \overset{\text{pyk}}{\to} \text{“meta p”}]$

$\mathcal{Q}$

$[\mathcal{Q} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{Q} \doteqdot \underline{\mathsf{q}}]\rceil)]$

$[\mathcal{Q} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal Q\}”}]$

$[\mathcal{Q} \overset{\text{pyk}}{\to} \text{“meta q”}]$

$\mathcal{R}$

$[\mathcal{R} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{R} \doteq \underline{\mathsf{r}}]\rceil)]$

$[\mathcal{R} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal R\}”}]$

$[\mathcal{R} \overset{\text{pyk}}{\to} \text{“meta r”}]$

$\mathcal{S}$

$[\mathcal{S} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{S} \doteq \underline{\mathsf{s}}]\rceil)]$

$[\mathcal{S} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal S\}”}]$

$[\mathcal{S} \overset{\text{pyk}}{\to} \text{“meta s”}]$

$\mathcal{T}$

$[\mathcal{T} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{T} \doteq \underline{\mathsf{t}}]\rceil)]$

$[\mathcal{T} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal T\}”}]$

$[\mathcal{T} \overset{\text{pyk}}{\to} \text{“meta t”}]$

$\mathcal{U}$

$[\mathcal{U} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{U} \doteq \underline{\mathsf{u}}]\rceil)]$

$[\mathcal{U} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal U\}”}]$

$[\mathcal{U} \overset{\text{pyk}}{\to} \text{“meta u”}]$

$\mathcal{V}$

$[\mathcal{V} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{V} \doteq \underline{\mathsf{v}}]\rceil)]$

$[\mathcal{V} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal V\}”}]$

$[\mathcal{V} \overset{\text{pyk}}{\to} \text{“meta v”}]$

$\mathcal{W}$

$[\mathcal{W} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{W} \doteq \underline{\mathsf{w}}]\rceil)]$

$[\mathcal{W} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal W\}”}]$

$[\mathcal{W} \overset{\text{pyk}}{\to} \text{“meta w”}]$

$\mathcal{X}$

$[\mathcal{X} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{X} \doteq \underline{\mathsf{x}}]\rceil)]$

$[\mathcal{X} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal X\}”}]$

$[\mathcal{X} \overset{\text{pyk}}{\to} \text{“meta x”}]$

$\mathcal{Y}$

$[\mathcal{Y} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{Y} \doteq \underline{\mathsf{y}}]\rceil)]$

$[\mathcal{Y} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal Y\}”}]$

$[\mathcal{Y} \overset{\text{pyk}}{\to} \text{“meta y”}]$

$\mathcal{Z}$

$[\mathcal{Z} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathcal{Z} \doteq \underline{\mathsf{z}}]\rceil)]$

$[\mathcal{Z} \overset{\text{tex}}{\to} \text{“\{\textbackslash cal Z\}”}]$

$[\mathcal{Z} \overset{\text{pyk}}{\to} \text{“meta z”}]$

$\langle * \mid * := * \rangle$

$[\langle \mathsf{a} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle \overset{\text{val}}{\to} \mathsf{x}!\ [\ \mathsf{b}!$
$\mathrm{If}(\mathsf{a}^{\mathcal{V}}, \mathrm{If}(\mathsf{a} \overset{\text{t}}{=} \mathsf{x}, \mathsf{b}, \mathsf{a}),$
$\mathrm{If}(\neg\ [\ \mathsf{a} \overset{\text{r}}{=} \lceil\forall{*}{:}\,*\rceil\ ]\ , \mathsf{a}^{\text{h}} :: \langle {}^{*}\mathsf{a}^{\text{t}} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle,$
$\mathrm{If}(\mathsf{a}^{1} \overset{\text{t}}{=} \mathsf{x}, \mathsf{a},$
$[\ \mathsf{a}^{0} ::\ [\ \mathsf{a}^{1} ::\ [\ \langle \mathsf{a}^{2} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle :: \mathsf{T}\ ]\ ]\ ]\ ))) \ ]\ ]$

$[\langle \mathsf{a} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle \overset{\text{tex}}{\to} \text{“}$
\langle #1.
\, \{\protect\vert\}#2.

{:=}\, #3.
\rangle "]

$[\langle \mathsf{a} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle \overset{\text{pyk}}{\to} \text{“sub } * \text{ set } * \text{ to } * \text{ end sub”}]$

$\left\langle {}^{*}* \;\middle|\; * := * \right\rangle$

$[\langle {}^{*}\mathsf{a} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle \overset{\text{val}}{\to} \mathsf{x}!\ [\ \mathsf{b}!\mathsf{If}(\mathsf{a}, \mathsf{T}, \langle \mathsf{a}^{\mathsf{h}} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle :: \langle {}^{*}\mathsf{a}^{\mathsf{t}} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle)\ ]\ ]$

$[\langle {}^{*}\mathsf{a} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle \overset{\text{tex}}{\to} \text{“}$
\langle ^ { \ast } #1.
\, {\protect\vert}#2.
{:=}\, #3.
\rangle "]

$[\langle {}^{*}\mathsf{a} \,|\mathsf{x}{:=}\, \mathsf{b}\rangle \overset{\text{pyk}}{\to} \text{“sub star } * \text{ set } * \text{ to } * \text{ end sub”}]$

$\emptyset$

$[\emptyset \overset{\text{val}}{\to} \mathsf{T}]$

$[\emptyset \overset{\text{tex}}{\to} \text{“}$
\emptyset "]

$[\emptyset \overset{\text{pyk}}{\to} \text{“the empty set”}]$

Remainder

$[\text{Remainder} \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[\text{Remainder} \doteqdot \text{HeadPair}' \oplus\ [$
Transitivity$' \oplus$ Contra$'$]]])]

$[\text{Remainder} \overset{\text{tex}}{\to} \text{“}$
Remainder"]

$[\text{Remainder} \overset{\text{pyk}}{\to} \text{“example remainder”}]$

$\left(*\right)^{\mathbf{v}}$

$[(\mathsf{x})^{\mathbf{v}} \overset{\text{name}}{\to} \text{“}$
(#1.
)^{\bf v}"]

$[(\mathsf{x})^{\mathbf{v}} \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[(\mathsf{x})^{\mathbf{v}} \doteqdot \mathsf{x}]\rceil)]$

$[(\mathsf{x})^{\mathbf{v}} \overset{\text{tex}}{\to} \text{“\#1/tex name.”}]$

$[(\mathsf{x})^{\mathbf{v}} \overset{\text{pyk}}{\to} \text{“make visible } * \text{ end visible”}]$

$\text{intro}(*, *, *, *)$

$[\text{intro}(\mathsf{x}, \mathsf{i}, \mathsf{p}, \mathsf{t}) \overset{\text{name}}{\to} \text{“}$
intro(#1.
,#2.
,#3.
,#4.
)”]

$[\text{intro}(\mathsf{x}, \mathsf{i}, \mathsf{p}, \mathsf{t}) \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[\text{intro}(\mathsf{x}, \mathsf{i}, \mathsf{p}, \mathsf{t}) \ddot{=}$
math $[\mathsf{x} \overset{\text{pyk}}{=} \mathsf{p}]$ end mathmath $[\mathsf{x} \overset{\text{tex}}{=} \mathsf{t}]$ end math$]\rceil)]$

$[\text{intro}(\mathsf{x}, \mathsf{i}, \mathsf{p}, \mathsf{t}) \overset{\text{tex}}{\to} \text{“}$\index{#2.: #3. @#2.: $[#1/tex name/tex.]$ #3.}%
\index{#3. $[#1/tex name/tex.]$}%
\tex{
$[#1/tex name/tex.
\stackrel {\mathrm {tex}}{=} #4/tex name.
]$}$[#1/tex name/tex.%
]$\footnote{$[#1/tex name/tex.
\stackrel {\mathrm {pyk}}{=} #3/tex name.
]$}”]

$[\text{intro}(\mathsf{x}, \mathsf{i}, \mathsf{p}, \mathsf{t}) \overset{\text{pyk}}{\to} \text{“intro } * \text{ index } * \text{ pyk } * \text{ tex } * \text{ end intro”}]$

$\text{intro}(*, *, *)$

$[\text{intro}(\mathsf{x}, \mathsf{p}, \mathsf{t}) \overset{\text{name}}{\to} \text{“}$
intro(#1.
,#2.
,#3.
)”]

$[\text{intro}(\mathsf{x}, \mathsf{p}, \mathsf{t}) \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[\text{intro}(\mathsf{x}, \mathsf{p}, \mathsf{t}) \ddot{=}$
math $[\mathsf{x} \overset{\text{pyk}}{=} \mathsf{p}]$ end mathmath $[\mathsf{x} \overset{\text{tex}}{=} \mathsf{t}]$ end math$]\rceil)]$

$[\text{intro}(\mathsf{x}, \mathsf{p}, \mathsf{t}) \overset{\text{tex}}{\to} \text{“}$\index{\alpha #2. @\back \makebox[20mm][l]{$[#1/tex
name/tex.]$}#2.}%
\index{#2. $[#1/tex name/tex.]$}%
\tex{
$[#1/tex name/tex.
\stackrel {\mathrm {tex}}{=} #3/tex name.

]$}$[#1/tex name/tex.%
]$\footnote{$[#1/tex name/tex.
\stackrel {\mathrm {pyk}}{=} #2/tex name.
]$}"]

$[\mathrm{intro}(\mathsf{x},\mathsf{p},\mathsf{t}) \overset{\mathrm{pyk}}{\to} \text{“intro} * \text{pyk} * \text{tex} * \text{end intro”}]$

$\mathrm{error}(*,*)$

$[\mathrm{error}(\mathsf{m},\mathsf{t}) \overset{\mathrm{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathrm{error}(\mathsf{m},\mathsf{t}) \doteqdot \mathrm{error}_2(\lceil\mathsf{m}\rceil,\mathsf{t})]\rceil)]$

[error(m, t) $\overset{\mathrm{tex}}{\to}$ “
error(#1/tex name.
, #2.
)”]

$[\mathrm{error}(\mathsf{m},\mathsf{t}) \overset{\mathrm{pyk}}{\to} \text{“error} * \text{term} * \text{end error”}]$

$\mathrm{error}_2(*,*)$

$[\mathrm{error}_2(\mathsf{m},\mathsf{t}) \overset{\mathrm{val}}{\to} \mathsf{t}\text{-color}(\mathsf{m}^1\ [\ \lceil\text{“}$
$\text{”}\rceil^1\mathsf{t}\ ]\ )]$

[error$_2$(m, t) $\overset{\mathrm{tex}}{\to}$ “
error_{2}(#1/tex name.
, #2.
)”]

$[\mathrm{error}_2(\mathsf{m},\mathsf{t}) \overset{\mathrm{pyk}}{\to} \text{“error two} * \text{term} * \text{end error”}]$

$\mathrm{proof}(*,*,*)$

$[\mathrm{proof}(\mathsf{p},\mathsf{t},\mathsf{c}) \overset{\mathrm{val}}{\to} \mathrm{proof}_2(\mathcal{S}(\mathsf{c},\mathsf{p}),\mathsf{t})]$

[proof(p, t, c) $\overset{\mathrm{tex}}{\to}$ “
proof(#1.
, #2.
, #3.
)”]

$[\mathrm{proof}(\mathsf{p},\mathsf{t},\mathsf{c}) \overset{\mathrm{pyk}}{\to} \text{“proof} * \text{term} * \text{cache} * \text{end proof”}]$

$\mathrm{proof}_2(*,*)$

$[\mathrm{proof}_2(\mathsf{q},\mathsf{t}) \overset{\mathrm{val}}{\to} \mathsf{t}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}},\mathsf{q},$
$\mathrm{If}(\neg\ [\ \mathsf{q}^{0}\ ]\ ,\mathrm{error}_2(\lceil\text{“Proof has at least one unresolved premise. Lemma; premise reads:”}\rceil,\mathsf{t};\ [\ \mathsf{q}^{0\mathrm{h}}\ ]\ ),$
$\mathrm{If}(\neg\ [\ \mathsf{q}^{1}\ ]\ ,\mathrm{error}_2(\lceil\text{“Proof has at least one unresolved side condition. Lemma; condition reads:”}\rceil,\mathsf{t};\ [\ \mathsf{q}^{1\mathrm{h}}\ ]\ ),$
$\mathrm{If}(\mathsf{q}^{2} \overset{\mathrm{t}}{=} \mathsf{t},\mathsf{T},$
$\mathrm{error}_2(\lceil\text{“Lemma does not match conclusion. Lemma; conclusion reads:”}\rceil,\mathsf{t};\ [\ \mathsf{q}^{2}\ ]\ ))))))]$

$[\mathrm{proof}_2(\mathsf{q},\mathsf{t}) \overset{\mathrm{tex}}{\to} \text{“}$
proof_{2}(#1.
, #2.
)”]

$[\mathrm{proof}_2(\mathsf{q},\mathsf{t}) \overset{\mathrm{pyk}}{\to} \text{“proof two } * \text{ term } * \text{ end proof”}]$

$\mathcal{S}(*,*)$

$[\mathcal{S}(\mathsf{c},\mathsf{t}) \overset{\mathrm{val}}{\to} \mathsf{c}!$
$\mathrm{If}(\mathsf{t}^{\mathrm{E}},\mathsf{t},$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil *^{\mathrm{I}}\rceil,\mathcal{S}^{\mathrm{I}}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil *^{\triangleright}\rceil,\mathcal{S}^{\triangleright}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil *^{\mathrm{V}}\rceil,\mathcal{S}^{\mathrm{E}}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil *^{+}\rceil,\mathcal{S}^{+}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil *^{-}\rceil,\mathcal{S}^{-}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil *^{*}\rceil,\mathcal{S}^{*}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil * \mathbin{@} *\rceil,\mathcal{S}^{@}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil * \vdash *\rceil,\mathcal{S}^{\vdash}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil * \nVdash *\rceil,\mathcal{S}^{\nVdash}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil * \text{ i.e. } *\rceil,\mathcal{S}^{\text{i.e.}}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil \forall *\colon *\rceil,\mathcal{S}^{\forall}(\mathsf{c},\mathsf{t}),$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil *;*\rceil,\mathcal{S}^{;}(\mathsf{c},\mathsf{t}),$
$\mathrm{error}_2(\lceil\text{“Unknown sequent operator:”}\rceil,\mathsf{t}))))))))))))))]$

$[\mathcal{S}(\mathsf{x},\mathsf{y}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal S}(#1.
, #2.
)”]

$[\mathcal{S}(\mathsf{x},\mathsf{y}) \overset{\mathrm{pyk}}{\to} \text{“sequent eval } * \text{ term } * \text{ end eval”}]$

$\mathcal{S}^{\mathrm{I}}(*,*)$

$[\mathcal{S}^{\mathrm{I}}(\mathsf{c},\mathsf{t}) \overset{\mathrm{val}}{\to} \mathsf{c}!\ [\ \emptyset :: \ [\ \emptyset :: \ [\ \mathsf{t\text{-}color}(\mathsf{t}^1 \vdash \ [\ \mathsf{t}^1\ ]\ ) :: \mathsf{T}\ ]\ ]\ ]\ ]$

$[\mathcal{S}^{\mathrm{I}}(\mathsf{x},\mathsf{y}) \overset{\mathrm{tex}}{\to}$ “
{\cal S}^{I}(#1.
, #2.
)”]

$[\mathcal{S}^{\mathrm{I}}(\mathsf{x},\mathsf{y}) \overset{\mathrm{pyk}}{\to}$ “seqeval init $*$ term $*$ end eval”]

$\mathcal{S}^{\triangleright}(*,*)$

$[\mathcal{S}^{\triangleright}(\mathsf{c},\mathsf{t}) \overset{\mathrm{val}}{\to} \mathcal{S}_1^{\triangleright}(\mathsf{c},\mathsf{t},\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^{\triangleright}(\mathsf{x},\mathsf{y}) \overset{\mathrm{tex}}{\to}$ “
{\cal S}^{\rhd}(#1.
, #2.
)”]

$[\mathcal{S}^{\triangleright}(\mathsf{x},\mathsf{y}) \overset{\mathrm{pyk}}{\to}$ “seqeval modus $*$ term $*$ end eval”]

$\mathcal{S}_1^{\triangleright}(*,*,*)$

$[\mathcal{S}_1^{\triangleright}(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\mathrm{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}},\mathsf{q},$
$\mathrm{If}(\mathsf{q}^2 \overset{\mathrm{r}}{=} \lceil * \vdash * \rceil, \mathsf{q}^0 \cup \{\mathsf{q}^{21}\} :: \ [\ \mathsf{q}^1 :: \ [\ \mathsf{q}^{22} :: \mathsf{T}\ ]\ ]\ ,$
$\mathrm{If}(\mathsf{q}^2 \overset{\mathrm{r}}{=} \lceil * \vDash * \rceil, \mathsf{q}^0 :: \ [\ \mathsf{q}^1 \cup \{\mathsf{q}^{21}\} :: \ [\ \mathsf{q}^{22} :: \mathsf{T}\ ]\ ]\ ,$
$\mathrm{error}_2(\lceil$ “The modus operation requires the conclusion of its argument to be an inference or an endorsement” $\rceil, \mathsf{t}))))\ ]\ ]$

$[\mathcal{S}_1^{\triangleright}(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\mathrm{tex}}{\to}$ “
{\cal S}_{1}^{\rhd}(#1.
, #2.
, #3.
)”]

$[\mathcal{S}_1^{\triangleright}(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\mathrm{pyk}}{\to}$ “seqeval modus one $*$ term $*$ sequent $*$ end eval”]

$\mathcal{S}^{\mathrm{E}}(*,*)$

$[\mathcal{S}^{\mathrm{E}}(\mathsf{c},\mathsf{t}) \overset{\mathrm{val}}{\to} \mathcal{S}_1^{\mathrm{E}}(\mathsf{c},\mathsf{t},\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^{\mathrm{E}}(\mathsf{x},\mathsf{y}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal S}^{E}(#1.
, #2.
)”]

$[\mathcal{S}^{\mathrm{E}}(\mathsf{x},\mathsf{y}) \overset{\mathrm{pyk}}{\to} \text{“seqeval verify} * \text{term} * \text{end eval”}]$

$\mathcal{S}_1^{\mathrm{E}}(*,*,*)$

$[\mathcal{S}_1^{\mathrm{E}}(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\mathrm{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}},\mathsf{q},$
$\mathrm{If}(\neg\ [\ \mathsf{q}^2 \overset{\mathrm{r}}{=} \ulcorner * \Vdash * \urcorner\ ]\ , \mathrm{error}_2(\ulcorner \text{“The verify operation requires the conclusion of its argument to be an endorsement:”} \urcorner, \mathsf{t}),$
$\mathrm{If}(\neg\ [\ \mathsf{q}^{21\mathcal{C}}\ ]\ , \mathrm{error}_2(\ulcorner \text{“The verify operation requires the side condition to contain no metavariables. Term; condition:”} \urcorner, \mathsf{t};\ [\ \mathsf{q}^{21}\ ]\ ),$
$\mathrm{If}(\mathcal{U}^{\mathrm{M}}(\mathcal{U}^{\mathrm{M}}(\mathcal{E}(\mathsf{q}^{21},\mathsf{T},\mathsf{c}))\ \text{`}\ \mathsf{c}), \mathsf{q}^0 :: [\ \mathsf{q}^1 :: [\ \mathsf{q}^{22} :: \mathsf{T}\ ]\ ]\ ,$
$\mathrm{error}_2(\ulcorner \text{“False side condition:”} \urcorner, \mathsf{t}))))\ ]\ ]$

$[\mathcal{S}_1^{\mathrm{E}}(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal S}_{1}^{E}(#1.
, #2.
, #3.
)”]

$[\mathcal{S}_1^{\mathrm{E}}(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\mathrm{pyk}}{\to} \text{“seqeval verify one} * \text{term} * \text{sequent} * \text{end eval”}]$

$\mathcal{S}^{+}(*,*)$

$[\mathcal{S}^{+}(\mathsf{c},\mathsf{t}) \overset{\mathrm{val}}{\to} \mathcal{S}_1^{+}(\mathsf{c},\mathsf{t},\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^{+}(\mathsf{x},\mathsf{y}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal S}^{+}(#1.
, #2.
)”]

$[\mathcal{S}^{+}(\mathsf{x},\mathsf{y}) \overset{\mathrm{pyk}}{\to} \text{“sequent eval plus} * \text{term} * \text{end eval”}]$

$\mathcal{S}_1^{+}(*,*,*)$

$[\mathcal{S}_1^{+}(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\mathrm{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}},\mathsf{q},$
$\mathrm{If}(\ [\ \mathsf{q}^2 \overset{\mathrm{r}}{=} \ulcorner * \vdash * \urcorner\ ]\ \wedge\ [\ \mathsf{q}^{22} \overset{\mathrm{r}}{=} \ulcorner * \vdash * \urcorner\ ]\ ,$

$[\mathsf{q}^0 :: [\mathsf{q}^1 :: [\mathsf{t}\text{-color}([\mathsf{q}^{21} \oplus [\mathsf{q}^{221}]] \vdash [\mathsf{q}^{222}]) :: \mathsf{T}]]],$
$\mathrm{error}_2(\lceil \text{“Term; conclusion not fit for decurrying:”} \rceil, \mathsf{t}; [\mathsf{q}^2]))]]$

$[\mathcal{S}_1^+(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{+}(#1.
, #2.
, #3.
)”]

$[\mathcal{S}_1^+(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\text{pyk}}{\to} \text{“seqeval plus one } * \text{ term } * \text{ sequent } * \text{ end eval”}]$

$\mathcal{S}^-(*,*)$

$[\mathcal{S}^-(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^-(\mathsf{c},\mathsf{t},\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^-(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}^{-}(#1.
, #2.
)”]

$[\mathcal{S}^-(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to} \text{“seqeval minus } * \text{ term } * \text{ end eval”}]$

$\mathcal{S}_1^-(*,*,*)$

$[\mathcal{S}_1^-(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\,[\,\mathsf{t}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}}, \mathsf{q},$
$\mathrm{If}([\mathsf{q}^2 \overset{\mathrm{r}}{=} \lceil * \vdash * \rceil] \wedge [\mathsf{q}^{21} \overset{\mathrm{r}}{=} \lceil * \oplus * \rceil],$
$[\mathsf{q}^0 :: [\mathsf{q}^1 :: [\mathsf{t}\text{-color}(\mathsf{q}^{211} \vdash [\mathsf{q}^{212} \vdash [\mathsf{q}^{22}]]) :: \mathsf{T}]]],$
$\mathrm{error}_2(\lceil \text{“Term; conclusion not fit for decurrying:”} \rceil, \mathsf{t}; [\mathsf{q}^2]))]]$

$[\mathcal{S}_1^-(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{-}(#1.
, #2.
, #3.
)”]

$[\mathcal{S}_1^-(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\text{pyk}}{\to} \text{“seqeval minus one } * \text{ term } * \text{ sequent } * \text{ end eval”}]$

$\mathcal{S}^*(*,*)$

$[\mathcal{S}^*(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^*(\mathsf{c},\mathsf{t},\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^*(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$

{\cal S}^{\ast}(#1.
, #2.
)”]

$[\mathcal{S}^*(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to} \text{“seqeval deref } * \text{ term } * \text{ end eval”}]$

$\mathcal{S}_1^*(*,*,*)$

$[\mathcal{S}_1^*(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!$
$\text{If}(\mathsf{q}^{\text{E}}, \mathsf{q},$
$\mathcal{S}_2^*(\mathsf{c},\mathsf{t},\mathsf{q},\textbf{aspect}(<\text{stmt}>,\mathsf{q}^2,\mathsf{c})))\ ]\ ]$

$[\mathcal{S}_1^*(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{\ast}(#1.
, #2.
, #3.
)”]

$[\mathcal{S}_1^*(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\text{pyk}}{\to} \text{“seqeval deref one } * \text{ term } * \text{ sequent } * \text{ end eval”}]$

$\mathcal{S}_2^*(*,*,*,*)$

$[\mathcal{S}_2^*(\mathsf{c},\mathsf{t},\mathsf{q},\mathsf{d}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!\ [\ \mathsf{q}!$
$\text{If}(\mathsf{d}, \text{error}_2(\lceil\text{“Dereferencing construct that has no statement def:”}\rceil, \mathsf{t}),$
$[\ \mathsf{q}^0 :: [\ \mathsf{q}^1 :: [\ \mathsf{d}^3 :: \mathsf{T}\ ]\ ]\ ]\ )\ ]\ ]$

$[\mathcal{S}_2^*(\mathsf{c},\mathsf{t},\mathsf{q},\mathsf{d}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{2}^{\ast}(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{S}_2^*(\mathsf{c},\mathsf{t},\mathsf{q},\mathsf{d}) \overset{\text{pyk}}{\to} \text{“seqeval deref two } * \text{ term } * \text{ sequent } * \text{ def } * \text{ end eval”}]$

$\mathcal{S}^{@}(*,*)$

$[\mathcal{S}^{@}(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^{@}(\mathsf{c},\mathsf{t},\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^{@}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}^{\ast}(#1.
, #2.
)”]

$[\mathcal{S}^{@}(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to} \text{“seqeval at } * \text{ term } * \text{ end eval”}]$

$\mathcal{S}_1^{@}(*,*,*)$

$[\mathcal{S}_1^{@}(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!$
$\text{If}(\mathsf{q}^{\text{E}},\mathsf{q},$
$\text{If}(\neg\ [\ \mathsf{q}^2 \overset{\text{r}}{=} \ulcorner\forall *\colon *\urcorner\ ]\ , \text{error}_2(\ulcorner\text{“Quantifier elimination requires the conclusion of its argument to be a quantifier:”}\urcorner, \mathsf{t}),$
$\text{If}(\neg\ [\ \mathsf{t}^2 \text{ free for } \mathsf{q}^{21} \text{ in } [\ \mathsf{q}^{22}\ ]\ ]\ , \text{error}_2(\ulcorner\text{“Quantifier elimination leads to variable clash:”}\urcorner, \mathsf{t}),$
$[\ \mathsf{q}^0 :: [\ \mathsf{q}^1 :: [\ \langle \mathsf{q}^{22} | \mathsf{q}^{21} := \mathsf{t}^2 \rangle :: \mathsf{T}\ ]\ ]\ ]\ ))))\ ]\ ]$

$[\mathcal{S}_1^{@}(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{\char64}(#1.
, #2.
, #3.
)”]

$[\mathcal{S}_1^{@}(\mathsf{c},\mathsf{t},\mathsf{q}) \overset{\text{pyk}}{\to} \text{“seqeval at one } * \text{ term } * \text{ sequent } * \text{ end eval”}]$

$\mathcal{S}^{\vdash}(*,*)$

$[\mathcal{S}^{\vdash}(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^{\vdash}(\mathsf{c},\mathsf{t},\mathsf{t}^1,\mathcal{S}(\mathsf{c},\mathsf{t}^2))]$

$[\mathcal{S}^{\vdash}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}^{\vdash}(#1.
, #2.
)”]

$[\mathcal{S}^{\vdash}(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to} \text{“seqeval infer } * \text{ term } * \text{ end eval”}]$

$\mathcal{S}_1^{\vdash}(*,*,*,*)$

$[\mathcal{S}_1^{\vdash}(\mathsf{c},\mathsf{t},\mathsf{p},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!\ [\ \mathsf{p}!$
$\text{If}(\mathsf{q}^{\text{E}},\mathsf{q},$
$[\ \mathsf{q}^0 \backslash \{\mathsf{p}\} :: [\ \mathsf{q}^1 :: [\ \text{t-color}(\mathsf{p} \vdash [\ \mathsf{q}^2\ ]\ ) :: \mathsf{T}\ ]\ ]\ ]\ )\ ]\ ]\ ]$

$[\mathcal{S}_1^{\vdash}(\mathsf{x},\mathsf{y},\mathsf{z},\mathsf{u}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{\vdash}(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{S}_1^{\vdash}(\mathsf{x},\mathsf{y},\mathsf{z},\mathsf{u}) \overset{\text{pyk}}{\to} \text{“seqeval infer one} * \text{term} * \text{premise} * \text{sequent} * \text{end eval”}]$

$\mathcal{S}^{\Vdash}(*,*)$

$[\mathcal{S}^{\Vdash}(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^{\Vdash}(\mathsf{c},\mathsf{t},\mathsf{t}^1,\mathcal{S}(\mathsf{c},\mathsf{t}^2))]$

$[\mathcal{S}^{\Vdash}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}^{\makebox [0mm][l]{\scriptsize $\vdash $}\, {\vdash }}(#1.
, #2.
)”]

$[\mathcal{S}^{\Vdash}(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to} \text{“seqeval endorse} * \text{term} * \text{end eval”}]$

$\mathcal{S}_1^{\Vdash}(*,*,*,*)$

$[\mathcal{S}_1^{\Vdash}(\mathsf{c},\mathsf{t},\mathsf{p},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!\ [\ \mathsf{p}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}},\mathsf{q},$
$[\ \mathsf{q}^0 :: \ [\ \mathsf{q}^1 \backslash \{\mathsf{p}\} :: \ [\ \text{t-color}(\mathsf{p} \Vdash \ [\ \mathsf{q}^2\ ]\ ) :: \mathsf{T}\ ]\ ]\ ]\ )\ ]\ ]\ ]$

$[\mathcal{S}_1^{\Vdash}(\mathsf{x},\mathsf{y},\mathsf{z},\mathsf{u}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{\makebox [0mm][l]{\scriptsize $\vdash $}\, {\vdash }}(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{S}_1^{\Vdash}(\mathsf{x},\mathsf{y},\mathsf{z},\mathsf{u}) \overset{\text{pyk}}{\to} \text{“seqeval endorse one} * \text{term} * \text{side} * \text{sequent} * \text{end eval”}]$

$\mathcal{S}^{\text{i.e.}}(*,*)$

$[\mathcal{S}^{\text{i.e.}}(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^{\text{i.e.}}(\mathsf{c},\mathsf{t},\mathsf{t}^2,\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^{\text{i.e.}}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}^{i.e.}(#1.
, #2.
)”]

$[\mathcal{S}^{\text{i.e.}}(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to} \text{“seqeval est} * \text{term} * \text{end eval”}]$

$\mathcal{S}_1^{\text{i.e.}}(*,*,*,*)$

$[\mathcal{S}_1^{\text{i.e.}}(\mathsf{c},\mathsf{t},\mathsf{a},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!\ [\ \mathsf{a}!$
$\text{If}(\mathsf{q}^{\text{E}},\mathsf{q},\mathcal{S}_2^{\text{i.e.}}(\mathsf{c},\mathsf{t},\mathsf{a},\mathsf{q},\textbf{aspect}(<\text{stmt}>,\mathsf{a},\mathsf{c})))\ ]\ ]\ ]$

$[\mathcal{S}_1^{\text{i.e.}}(\mathsf{x},\mathsf{y},\mathsf{z},\mathsf{u}) \overset{\text{tex}}{\to}$ “
{\cal S}_{1}^{i.e.}(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{S}_1^{\text{i.e.}}(\mathsf{x},\mathsf{y},\mathsf{z},\mathsf{u}) \overset{\text{pyk}}{\to}$ “seqeval est one ∗ term ∗ name ∗ sequent ∗ end eval”]

$\mathcal{S}_2^{\text{i.e.}}(*,*,*,*,*)$

$[\mathcal{S}_2^{\text{i.e.}}(\mathsf{c},\mathsf{t},\mathsf{a},\mathsf{q},\mathsf{d}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!\ [\ \mathsf{a}!\ [\ \mathsf{q}!$
$\text{If}(\mathsf{d},\text{error}_2(\lceil\text{“Referencing construct that has no statement def:”}\rceil,\mathsf{t}),$
$\text{If}(\neg\ [\ \mathsf{d}^3 \overset{\text{t}}{=} [\ \mathsf{q}^2\ ]\ ]\ ,\text{error}_2(\lceil\text{“Reference; conclusion do not match:”}\rceil,\mathsf{a};\ [\ \mathsf{q}^2\ ]\ ),$
$[\ \mathsf{q}^0 :: [\ \mathsf{q}^1 :: [\ \mathsf{a} :: \mathsf{T}\ ]\ ]\ ]\ ))\ ]\ ]\ ]\ ]$

$[\mathcal{S}_2^{\text{i.e.}}(\mathsf{c},\mathsf{t},\mathsf{a},\mathsf{q},\mathsf{d}) \overset{\text{tex}}{\to}$ “
{\cal S}_{2}^{i.e.}(#1.
, #2.
, #3.
, #4.
, #5.
)”]

$[\mathcal{S}_2^{\text{i.e.}}(\mathsf{c},\mathsf{t},\mathsf{a},\mathsf{q},\mathsf{d}) \overset{\text{pyk}}{\to}$ “seqeval est two ∗ term ∗ name ∗ sequent ∗ def ∗ end eval”]

$\mathcal{S}^{\forall}(*,*)$

$[\mathcal{S}^{\forall}(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^{\forall}(\mathsf{c},\mathsf{t},\mathsf{t}^1,\mathcal{S}(\mathsf{c},\mathsf{t}^2))]$

$[\mathcal{S}^{\forall}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to}$ “
{\cal S}^{\forall}(#1.
, #2.
)”]

$[\mathcal{S}^{\forall}(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to}$ “seqeval all ∗ term ∗ end eval”]

$\mathcal{S}_1^{\forall}(*,*,*,*)$

$[\mathcal{S}_1^{\forall}(\mathsf{c},\mathsf{t},\mathsf{v},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!\ [\ \mathsf{v}!$
$\text{If}(\mathsf{q}^{\text{E}},\mathsf{q},$
$\text{If}(\neg\ [\ \mathsf{v}^{\mathcal{V}}\ ]\ ,\text{error}_2(\lceil\text{“Metageneralization over non-metavariable:”}\rceil,\mathsf{t}),$
$\text{If}(\mathsf{v}\text{ free in }\ [\ \mathsf{q}^0\ ]\ ,\text{error}_2(\lceil\text{“Metageneralization over metavariable that occurs free in some premise:”}\rceil,\mathsf{t}),$
$\text{If}(\mathsf{v}\text{ free in }\ [\ \mathsf{q}^1\ ]\ ,\text{error}_2(\lceil\text{“Metageneralization over metavariable that occurs free in some side condition:”}\rceil,\mathsf{t}),$
$[\ \mathsf{q}^0 :: \ [\ \mathsf{q}^1 :: \ [\ \mathsf{t}\text{-color}(\forall\mathsf{v}:\ [\ \mathsf{q}^2\ ]\ ) :: \mathsf{T}\ ]\ \ ]\ \ ]\ ))))\ ]\ \ ]\ ]$

$[\mathcal{S}_1^{\forall}(\mathsf{c},\mathsf{t},\mathsf{v},\mathsf{q}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{\forall}(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{S}_1^{\forall}(\mathsf{c},\mathsf{t},\mathsf{v},\mathsf{q}) \overset{\text{pyk}}{\to} \text{“seqeval all one } * \text{ term } * \text{ variable } * \text{ sequent } * \text{ end eval”}]$

$\mathcal{S}^{;}(*,*)$

$[\mathcal{S}^{;}(\mathsf{c},\mathsf{t}) \overset{\text{val}}{\to} \mathcal{S}_1^{;}(\mathsf{c},\mathsf{t},\mathcal{S}(\mathsf{c},\mathsf{t}^1))]$

$[\mathcal{S}^{;}(\mathsf{x},\mathsf{y}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}^{;}(#1.
, #2.
)”]

$[\mathcal{S}^{;}(\mathsf{x},\mathsf{y}) \overset{\text{pyk}}{\to} \text{“seqeval cut } * \text{ term } * \text{ end eval”}]$

$\mathcal{S}_1^{;}(*,*,*)$

$[\mathcal{S}_1^{;}(\mathsf{c},\mathsf{t},\mathsf{p}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!$
$\text{If}(\mathsf{p}^{\text{E}},\mathsf{p},\mathcal{S}_2^{;}(\mathsf{c},\mathsf{t},\mathsf{p},\mathcal{S}(\mathsf{c},\mathsf{t}^2)))\ ]\ ]$

$[\mathcal{S}_1^{;}(\mathsf{x},\mathsf{y},\mathsf{z}) \overset{\text{tex}}{\to} \text{“}$
{\cal S}_{1}^{;}(#1.
, #2.
, #3.
)”]

$[\mathcal{S}_1^{;}(\mathsf{c},\mathsf{t},\mathsf{p}) \overset{\text{pyk}}{\to} \text{“seqeval cut one } * \text{ term } * \text{ forerunner } * \text{ end eval”}]$

$\mathcal{S}_2^{;}(*,*,*,*)$

$[\mathcal{S}_2^{;}(\mathsf{c},\mathsf{t},\mathsf{p},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{t}!\ [\ \mathsf{p}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}},\mathsf{q},\ [\ \mathsf{p}^0 \cup [\ \mathsf{q}^0 \backslash \{\mathsf{p}^2\}\ ]\ ]\ ::\ [\ [\ \mathsf{p}^1 \cup [\ \mathsf{q}^1\ ]\ ]\ ::\ [\ \mathsf{q}^2 :: \mathsf{T}\ ]\ ]\ )\ ]\ ]\ ]$

$[\mathcal{S}_2^{;}(\mathsf{c},\mathsf{t},\mathsf{p},\mathsf{q}) \overset{\text{tex}}{\to}$ “
{\cal S}_{2}^{;}(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{S}_2^{;}(\mathsf{x},\mathsf{y},\mathsf{z},\mathsf{u}) \overset{\text{pyk}}{\to}$ “seqeval cut two ∗ term ∗ forerunner ∗ sequent ∗ end eval”]

$\mathcal{T}(*)$

$[\mathcal{T}(\mathsf{x}) \overset{\text{val}}{\to} \mathsf{x}!\Lambda\lambda\mathsf{c}.\mathsf{x}]$

$[\mathcal{T}(\mathsf{x}) \overset{\text{tex}}{\to}$ “
{\cal T}(#1.
)”]

$[\mathcal{T}(\mathsf{x}) \overset{\text{pyk}}{\to}$ “computably true ∗ end true”]

$\mathrm{claims}(*,*,*)$

$[\mathrm{claims}(\mathsf{t},\mathsf{c},\mathsf{r}) \overset{\text{val}}{\to}$
$\mathrm{If}(\mathrm{claims}_2(\mathsf{t},\mathsf{c},\mathsf{r}),\mathsf{T},\mathrm{claims}_2(\mathsf{t},\mathsf{c},\mathsf{c}[\mathsf{r}][\texttt{"bibliography"}]^1))]$

$[\mathrm{claims}(\mathsf{t},\mathsf{c},\mathsf{r}) \overset{\text{tex}}{\to}$ “
claims(#1.
, #2.
, #3.
)”]

$[\mathrm{claims}(\mathsf{t},\mathsf{c},\mathsf{r}) \overset{\text{pyk}}{\to}$ “claims ∗ cache ∗ ref ∗ end claims”]

$\mathrm{claims}_2(*,*,*)$

$[\mathrm{claims}_2(\mathsf{t},\mathsf{c},\mathsf{r}) \overset{\text{val}}{\to} \mathrm{If}(\neg\ [\ \mathsf{r}^{\mathsf{c}}\ ]\ ,\mathsf{t}!\ [\ \mathsf{c}!\mathsf{F}\ ]\ ,\mathsf{t} \in_{\mathsf{c}}\ [\ \mathsf{c}[\mathsf{r}][\texttt{"codex"}][\mathsf{r}][0][0][\texttt{"claim"}]^3\ ]\ )]$

$[\mathrm{claims}_2(\mathsf{t},\mathsf{c},\mathsf{r}) \overset{\text{tex}}{\to}$ “
claims_2(#1.

, #2.
, #3.
)"]

[$\mathrm{claims}_2(\mathsf{t}, \mathsf{c}, \mathsf{r}) \overset{\mathrm{pyk}}{\to}$ "claims two $*$ cache $*$ ref $*$ end claims"]

<proof>

[<proof> $\overset{\mathrm{val}}{\to} \lceil$<proof>$\rceil$]

[<proof> $\overset{\mathrm{tex}}{\to}$ "
{<}proof{>}"]

[<proof> $\overset{\mathrm{pyk}}{\to}$ "the proof aspect"]

proof

[proof $\overset{\mathrm{msg}}{\to}$ <proof>]

[proof $\overset{\mathrm{tex}}{\to}$ "
proof"]

[proof $\overset{\mathrm{pyk}}{\to}$ "proof"]

[**Lemma** $*$: $*$]

[[**Lemma** x: y] $\overset{\mathrm{macro}}{\to}$ $\lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[[\textbf{Lemma}\ \mathsf{x}\colon \mathsf{y}] \doteq [\mathsf{x} \overset{\mathrm{stmt}}{\to} \mathsf{y}]]\rceil)$]

[[**Lemma** x: y] $\overset{\mathrm{tex}}{\to}$ "
[\mathbf{Lemma\ } #1.
\colon #2.
]"]

[[**Lemma** x: y] $\overset{\mathrm{pyk}}{\to}$ "lemma $*$ says $*$ end lemma"]

[**Proof of** $*$: $*$]

[[**Proof of** x: y] $\overset{\mathrm{macro}}{\to}$ $\lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[[\textbf{Proof of}\ \mathsf{x}\colon \mathsf{y}] \doteq [\mathsf{x} \overset{\mathrm{proof}}{\to} \mathsf{y}]]\rceil)$]

[[**Proof of** x: y] $\overset{\mathrm{tex}}{\to}$ "
[\mathbf{Proof\ of\ }#1/tex name/tex.
\colon #2.
]"]

[[**Proof of** x: y] $\overset{\text{pyk}}{\to}$ “proof of ∗ reads ∗ end proof”]

[∗ **lemma** ∗: ∗]

[[x **lemma** y: z] $\overset{\text{macro}}{\to}$ λt.λs.λc.$\tilde{\mathcal{M}}_4$(t, s, c, ⌈[[x **lemma** y: z] $\doteqdot$ [y $\overset{\text{stmt}}{=}$ x $\vdash$ z]]⌉)]

[[x **lemma** y: z] $\overset{\text{tex}}{\to}$ “
[#1.
\mathbf{\ lemma\ } #2.
\colon #3.
]”]

[[x **lemma** y: z] $\overset{\text{pyk}}{\to}$ “in theory ∗ lemma ∗ says ∗ end lemma”]

[∗ **antilemma** ∗: ∗]

[[x **antilemma** y: z] $\overset{\text{macro}}{\to}$ λt.λs.λc.$\tilde{\mathcal{M}}_4$(t, s, c, ⌈[[x **antilemma** y: z] $\doteqdot$
[x **lemma** y: z $\vdash$ ⫫]]⌉)]

[[x **antilemma** y: z] $\overset{\text{tex}}{\to}$ “
[#1.
\mathbf{\ antilemma\ } #2.
\colon #3.
]”]

[[x **antilemma** y: z] $\overset{\text{pyk}}{\to}$ “in theory ∗ antilemma ∗ says ∗ end antilemma”]

[∗ **rule** ∗: ∗]

[[x **rule** y: z] $\overset{\text{macro}}{\to}$ λt.λs.λc.$\tilde{\mathcal{M}}_4$(t, s, c, ⌈[[x **rule** y: z] $\doteqdot$
[x **lemma** y: z][**Proof of** y: Rule tactic]]⌉)]

[[x **rule** y: z] $\overset{\text{tex}}{\to}$ “
[#1.
\mathbf{\ rule\ } #2.
\colon #3.
]”]

[[x **rule** y: z] $\overset{\text{pyk}}{\to}$ “in theory ∗ rule ∗ says ∗ end rule”]

$[* \textbf{ antirule } *\colon *]$

$[[\mathsf{x}\ \textbf{antirule}\ \mathsf{y}\colon \mathsf{z}] \overset{\text{macro}}{\to} \lambda t.\lambda s.\lambda c.\tilde{\mathcal{M}}_4(t, s, c, \ulcorner[[\mathsf{x}\ \textbf{antirule}\ \mathsf{y}\colon \mathsf{z}] \doteqdot [\mathsf{x}\ \textbf{rule}\ \mathsf{y}\colon \mathsf{z} \vdash \perp\!\!\!\perp]]\urcorner)]$

$[[\mathsf{x}\ \textbf{antirule}\ \mathsf{y}\colon \mathsf{z}] \overset{\text{tex}}{\to}$ “
[#1.
\mathbf{\ antirule\ } #2.
\colon #3.
]”]

$[[\mathsf{x}\ \textbf{antirule}\ \mathsf{y}\colon \mathsf{z}] \overset{\text{pyk}}{\to}$ “in theory $*$ antirule $*$ says $*$ end antirule”]

verifier

$[\text{verifier} \overset{\text{val}}{\to} \lambda t.\lambda c.\mathcal{V}_1(c)]$

$[\text{verifier} \overset{\text{pyk}}{\to}$ “verifier”]

$\mathcal{V}_1(*)$

$[\mathcal{V}_1(\mathsf{c}) \overset{\text{val}}{\to}$
$\text{let}_1(\lambda \mathsf{r}.$
$\text{let}_1(\lambda \mathsf{x}.$
$\text{let}_1(\lambda \mathsf{p}.$
$\text{let}_1(\lambda \mathsf{d}.$
$\text{If}(\neg \mathsf{d}, \mathsf{d},$
$\text{let}_1(\lambda \mathsf{i}.$
$\text{If}(\neg\ [\ \mathsf{i}^{c}\ ]\ , \mathsf{T},$
$\text{error}_2(\ulcorner$“Circular proof. Circle
includes:”$\urcorner, \mathsf{p}[\mathsf{i}]^{0h})), \mathcal{V}_5(\mathsf{c}, \mathsf{r}, \mathsf{p}, \mathsf{p}))), \mathcal{V}_3(\mathsf{c}, \mathsf{r}, \mathsf{p}, \mathsf{T})), \mathcal{V}_2(\mathsf{c}, \mathsf{x})), \mathsf{c}[\mathsf{r}][\texttt{"codex"}][\mathsf{r}]), \mathsf{c}[0])]$

$[\mathcal{V}_1(\mathsf{c}) \overset{\text{tex}}{\to}$ “
{\cal V}_1(#1.
)”]

$[\mathcal{V}_1(\mathsf{c}) \overset{\text{pyk}}{\to}$ “verify one $*$ end verify”]

$\mathcal{V}_2(*, *)$

$[\mathcal{V}_2(\mathsf{c}, \mathsf{p}) \overset{\text{val}}{\to} \mathsf{c}!$
$\text{If}(\mathsf{p}, \mathsf{T},$
$\text{If}(\neg\ [\ \mathsf{p}^{hc}\ ]\ , \mathcal{V}_2(\mathsf{c}, \mathsf{p}^{h}) :: \mathcal{V}_2(\mathsf{c}, \mathsf{p}^{t}), \mathsf{p}^{h} ::$

$\mathrm{let}_1(\lambda \mathsf{d}.$
$\mathrm{If}(\mathsf{d}, \mathsf{T},$
$\mathrm{let}_1(\lambda \mathsf{r}.$
$\mathrm{If}(\mathsf{r}^{\mathrm{E}}, \mathrm{error}_2(\lceil \text{“Error in proof of”} \rceil, \mathsf{d}^2\ [\ \lceil \text{“}$
$\text{”} \rceil^1 \mathsf{r}\ ]\ ), \mathsf{r}), \mathcal{S}(\mathsf{c}, \mathcal{U}^{\mathrm{M}}(\ [\ \mathcal{E}(\mathsf{d}^3, \mathsf{T}, \mathsf{c})\ \text{‘}\ \mathsf{c}\ ]\ \text{‘}\ \mathsf{p}))))), \mathbf{aspect}(\text{<proof>}, \mathsf{p}^{\mathrm{t}}))))]$

$[\mathcal{V}_2(\mathsf{c}, \mathsf{p}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal V}_2(#1.
, #2.
)”]

$[\mathcal{V}_2(\mathsf{c}, \mathsf{p}) \overset{\mathrm{pyk}}{\to} \text{“verify two} * \text{proofs} * \text{end verify”}]$

$\mathcal{V}_3(*, *, *, *)$

$[\mathcal{V}_3(\mathsf{c}, \mathsf{r}, \mathsf{p}, \mathsf{d}) \overset{\mathrm{val}}{\to} \mathsf{c}!\ [\ \mathsf{r}!\ [\ \mathsf{p}!$
$\mathrm{If}(\neg \mathsf{d}, \mathsf{d},$
$\mathrm{If}(\mathsf{p}, \mathsf{T},$
$\mathrm{If}(\neg\ [\ \mathsf{p}^{\mathrm{hc}}\ ]\ , \mathcal{V}_3(\mathsf{c}, \mathsf{r}, \mathsf{p}^{\mathrm{t}}, \mathcal{V}_3(\mathsf{c}, \mathsf{r}, \mathsf{p}^{\mathrm{h}}, \mathsf{T})),$
$\mathrm{let}_1(\lambda \mathsf{i}.$
$\mathrm{let}_1(\lambda \mathsf{q}.$
$\mathrm{If}(\mathsf{q}, \mathsf{T},$
$\mathrm{If}(\mathsf{q}^{\mathrm{E}}, \mathsf{q},$
$\mathrm{If}(\neg\ [\ \mathsf{q}^1\ ]\ , \mathrm{error}_2(\lceil \text{“Unchecked sidecondition:”} \rceil, \mathsf{q}^{1\mathrm{h}}),$
$\mathrm{let}_1(\lambda \mathsf{d}.$
$\mathrm{If}(\mathsf{d}, \mathrm{error}_2(\lceil \text{“Proof of non-existent lemma:”} \rceil, \mathsf{q}^2),$
$\mathrm{If}(\neg\ [\ \mathsf{q}^2 \overset{\mathrm{t}}{=}\ [\ \mathsf{d}^3\ ]\ ]\ , \mathrm{error}_2(\lceil \text{“Lemma/proof mismatch:”} \rceil, \mathsf{d}^2;\ [\ \mathsf{q}^2\ ]\ ),$
$\mathcal{V}_4(\mathsf{c}, \mathsf{q}^0))), \mathbf{aspect}(\text{<stmt>}, \mathsf{c}[\mathsf{r}][\text{"codex"}][\mathsf{r}][\mathsf{i}])))))), \mathsf{p}^{\mathrm{t}}), \mathsf{p}^{\mathrm{h}}))))\ ]\ ]\ ]$

$[\mathcal{V}_3(\mathsf{c}, \mathsf{r}, \mathsf{p}, \mathsf{d}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal V}_3(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{V}_3(\mathsf{c}, \mathsf{r}, \mathsf{p}, \mathsf{d}) \overset{\mathrm{pyk}}{\to} \text{“verify three} * \text{ref} * \text{sequents} * \text{diagnose} * \text{end verify”}]$

$\mathcal{V}_4(*, *)$

$[\mathcal{V}_4(\mathsf{c}, \mathsf{p}) \overset{\mathrm{val}}{\to} \mathsf{c}!$
$\mathrm{If}(\mathsf{p}, \mathsf{T},$
$\mathrm{let}_1(\lambda \mathsf{d}.$
$\mathrm{If}(\neg \mathsf{d}, \mathsf{d},$

$\mathrm{let}_1(\lambda \mathsf{p}.$
$\mathrm{let}_1(\lambda \mathsf{r}.$
$\mathrm{let}_1(\lambda \mathsf{i}.$
$\mathrm{If}(\neg\ [\ \mathsf{c}[\mathsf{r}][\texttt{"diagnose"}]\ ]\ ,$
$\mathrm{error}_2(\lceil \text{“Reference to erroneous page”} \rceil, \mathsf{p}),$
$\mathrm{If}(\neg \mathrm{claims}(\lceil \mathrm{verifier} \rceil, \mathsf{c}, \mathsf{r}),$
$\mathrm{error}_2(\lceil \text{“Reference to unchecked lemma”} \rceil, \mathsf{p}),$
$\mathrm{If}(\mathbf{aspect}(<\mathrm{proof}>, \mathsf{p}, \mathsf{c}),$
$\mathrm{error}_2(\lceil \text{“Reference to unproved lemma”} \rceil, \mathsf{p}), \mathsf{T}))), \mathsf{p}^{\mathrm{i}}), \mathsf{p}^{\mathrm{r}}), \mathsf{p}^{\mathrm{h}})), \mathcal{V}_4(\mathsf{c}, \mathsf{p}^{\mathrm{t}})))]$

$[\mathcal{V}_4(\mathsf{c}, \mathsf{p}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal V}_4(#1.
, #2.
)”]

$[\mathcal{V}_4(\mathsf{c}, \mathsf{p}) \overset{\mathrm{pyk}}{\to} \text{“verify four } * \text{ premises } * \text{ end verify”}]$

$\mathcal{V}_5(*, *, *, *)$

$[\mathcal{V}_5(\mathsf{c}, \mathsf{r}, \mathsf{a}, \mathsf{q}) \overset{\mathrm{val}}{\to} \mathsf{c}!\ [\ \mathsf{r}!\ [\ \mathsf{a}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{c}}, \mathsf{q},$
$\mathrm{If}(\mathsf{a}, \mathsf{q},$
$\mathrm{If}(\neg\ [\ \mathsf{a}^{\mathrm{hc}}\ ]\ , \mathcal{V}_5(\mathsf{c}, \mathsf{r}, \mathsf{a}^{\mathrm{t}}, \mathcal{V}_5(\mathsf{c}, \mathsf{r}, \mathsf{a}^{\mathrm{h}}, \mathsf{q})),$
$\mathcal{V}_7(\mathsf{c}, \mathsf{r}, \mathsf{a}^{\mathrm{h}}, \mathsf{q}))))\ ]\ ]\ ]$

$[\mathcal{V}_5(\mathsf{c}, \mathsf{r}, \mathsf{a}, \mathsf{q}) \overset{\mathrm{tex}}{\to} \text{“}$
{\cal V}_5(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{V}_5(\mathsf{c}, \mathsf{r}, \mathsf{a}, \mathsf{q}) \overset{\mathrm{pyk}}{\to} \text{“verify five } * \text{ ref } * \text{ array } * \text{ sequents } * \text{ end verify”}]$

$\mathcal{V}_6(*, *, *, *)$

$[\mathcal{V}_6(\mathsf{c}, \mathsf{r}, \mathsf{p}, \mathsf{q}) \overset{\mathrm{val}}{\to} \mathsf{c}!\ [\ \mathsf{r}!\ [\ \mathsf{p}!$
$\mathrm{If}(\mathsf{q}^{\mathrm{c}}, \mathsf{q},$
$\mathrm{If}(\mathsf{p}, \mathsf{q},$
$\mathrm{let}_1(\lambda \mathsf{q}.$
$\mathrm{If}(\mathsf{q}^{\mathrm{c}}, \mathsf{q},$
$\mathrm{If}(\neg\ [\ \mathsf{r} \approx\ [\ \mathsf{p}^{\mathrm{hr}}\ ]\ ]\ , \mathsf{q},$
$\mathcal{V}_7(\mathsf{c}, \mathsf{r}, \mathsf{p}^{\mathrm{hi}}, \mathsf{q}))), \mathcal{V}_6(\mathsf{c}, \mathsf{r}, \mathsf{p}^{\mathrm{t}}, \mathsf{q}))))\ ]\ ]\ ]$

$[\mathcal{V}_6(\mathsf{c},\mathsf{r},\mathsf{p},\mathsf{q}) \overset{\text{tex}}{\to} \text{“}$
{\cal V}_6(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{V}_6(\mathsf{c},\mathsf{r},\mathsf{p},\mathsf{q}) \overset{\text{pyk}}{\to} \text{“verify six} * \text{ref} * \text{list} * \text{sequents} * \text{end verify”}]$

$\mathcal{V}_7(*,*,*,*)$

$[\mathcal{V}_7(\mathsf{c},\mathsf{r},\mathsf{i},\mathsf{q}) \overset{\text{val}}{\to} \mathsf{c}!\ [\ \mathsf{r}!$
$\text{let}_1(\lambda \mathsf{v}.$
$\text{If}(\mathsf{v},\mathsf{q},$
$\text{If}(\mathsf{v} \approx 0,\mathsf{i},$
$\text{If}(\mathsf{v} \approx 1,\mathsf{q},$
$\text{let}_1(\lambda \mathsf{q}.$
$\text{If}(\mathsf{q}^{\mathsf{c}},\mathsf{q},\mathsf{q}[\mathsf{i}{\to}1]),\mathcal{V}_6(\mathsf{c},\mathsf{r},\mathsf{v}^0,\mathsf{q}[\mathsf{i}{\to}0])))))),\mathsf{q}[\mathsf{i}])\ ]\ ]$

$[\mathcal{V}_7(\mathsf{c},\mathsf{r},\mathsf{i},\mathsf{q}) \overset{\text{tex}}{\to} \text{“}$
{\cal V}_7(#1.
, #2.
, #3.
, #4.
)”]

$[\mathcal{V}_7(\mathsf{c},\mathsf{r},\mathsf{i},\mathsf{q}) \overset{\text{pyk}}{\to} \text{“verify seven} * \text{ref} * \text{id} * \text{sequents} * \text{end verify”}]$

$\text{Cut}(*,*)$

$[\text{Cut}(\mathsf{a},\mathsf{b}) \overset{\text{val}}{\to} \text{If}(\mathsf{b},\mathsf{a},\mathsf{a};\mathsf{b})]$

$[\text{Cut}(\mathsf{a},\mathsf{b}) \overset{\text{tex}}{\to} \text{“}$
Cut(#1.
, #2.
)”]

$[\text{Cut}(\mathsf{a},\mathsf{b}) \overset{\text{pyk}}{\to} \text{“cut} * \text{and} * \text{end cut”}]$

$\text{Head}_{\oplus}(*)$

$[\text{Head}_{\oplus}(\mathsf{s}) \overset{\text{val}}{\to}\ [\ \mathsf{s}^1 \vdash\ [\ \mathsf{s}^2 \vdash\ [\ \mathsf{s}^{1\text{I}\triangleright}\ ]\ ]\ ]^{+\triangleright}]$

$[\mathrm{Head}_{\oplus}(\mathsf{s}) \overset{\mathrm{tex}}{\to} \text{“}$
Head_{\oplus} (#1.
)”$]$

$[\mathrm{Head}_{\oplus}(\mathsf{s}) \overset{\mathrm{pyk}}{\to} \text{“head} * \text{end head”}]$

$\mathrm{Tail}_{\oplus}(*)$

$[\mathrm{Tail}_{\oplus}(\mathsf{s}) \overset{\mathrm{val}}{\to} [\ \mathsf{s}^{1} \vdash [\ \mathsf{s}^{2\mathrm{I}}\ ]\ ]^{+\triangleright}]$

$[\mathrm{Tail}_{\oplus}(\mathsf{s}) \overset{\mathrm{tex}}{\to} \text{“}$
Tail_{\oplus} (#1.
)”$]$

$[\mathrm{Tail}_{\oplus}(\mathsf{s}) \overset{\mathrm{pyk}}{\to} \text{“tail} * \text{end tail”}]$

$\mathrm{rule}_{1}(*,*)$

$[\mathrm{rule}_{1}(\mathsf{s},\mathsf{t}) \overset{\mathrm{val}}{\to}$
$\mathrm{If}(\mathsf{s} \overset{\mathrm{t}}{=} \mathsf{t}, \mathsf{T},$
$\mathrm{If}(\neg [\ \mathsf{t} \overset{\mathrm{r}}{=} \lceil \mathsf{x} \oplus \mathsf{y} \rceil\ ], 0,$
$\mathrm{let}_{1}(\lambda \mathsf{p}.$
$\mathrm{If}(\neg [\ \mathsf{p}^{\mathrm{c}}\ ], \mathrm{Cut}(\mathrm{Head}_{\oplus}(\mathsf{t}), \mathsf{p}),$
$\mathrm{let}_{1}(\lambda \mathsf{p}.$
$\mathrm{If}(\neg [\ \mathsf{p}^{\mathrm{c}}\ ], \mathrm{Cut}(\mathrm{Tail}_{\oplus}(\mathsf{t}), \mathsf{p}), 0), \mathrm{rule}_{1}(\mathsf{s}, \mathsf{t}^{2}))), \mathrm{rule}_{1}(\mathsf{s}, \mathsf{t}^{1}))))]$

$[\mathrm{rule}_{1}(\mathsf{s},\mathsf{t}) \overset{\mathrm{tex}}{\to} \text{“}$
rule_1(#1.
, #2.
)”$]$

$[\mathrm{rule}_{1}(\mathsf{s},\mathsf{t}) \overset{\mathrm{pyk}}{\to} \text{“rule one} * \text{theory} * \text{end rule”}]$

$\mathrm{rule}(*,*)$

$[\mathrm{rule}(\mathsf{c},\mathsf{p}) \overset{\mathrm{val}}{\to} \mathsf{c}!$
$\mathrm{let}_{1}(\lambda \mathsf{s}.$
$\mathrm{If}(\mathsf{s}, \lceil \text{“Rule has no statement aspect”} \rceil,$
$\mathrm{If}(\neg [\ \mathsf{s} \overset{\mathrm{r}}{=} \lceil \mathsf{x} \vdash \mathsf{y} \rceil\ ], \mathrm{error}_{2}(\lceil \text{“Rule has invalid statement aspect”} \rceil, \mathsf{s}),$
$\mathrm{let}_{1}(\lambda \mathsf{t}.$
$\mathrm{If}(\mathsf{t}, \lceil \text{“Theory has no statement aspect”} \rceil,$
$\mathrm{let}_{1}(\lambda \mathsf{r}.$

$\mathrm{If}(\mathsf{r}^{\mathsf{c}}, \mathrm{error}_2(\lceil \text{“The theory does not assert the given rule”} \rceil, \mathsf{s}; \mathsf{t}),$
$[\ \mathsf{s}^1 \vdash \mathrm{Cut}(\mathsf{s}^{1\mathrm{I}\triangleright *}, \mathsf{r})\ ]$
$), \mathrm{rule}_1(\mathsf{s}^2, \mathsf{t}))), \mathbf{aspect}(<\mathrm{stmt}>, \mathsf{s}^1, \mathsf{c})^3))), \mathbf{aspect}(<\mathrm{stmt}>, \mathsf{p}^{\mathsf{t}})^3)]$

$[\mathrm{rule}(\mathsf{c}, \mathsf{p}) \overset{\mathrm{tex}}{\to} \text{“}$
rule(#1.
, #2.
)”]

$[\mathrm{rule}(\mathsf{c}, \mathsf{p}) \overset{\mathrm{pyk}}{\to} \text{“rule } * \text{ subcodex } * \text{ end rule”}]$

Rule tactic

$[\text{Rule tactic} \overset{\mathrm{val}}{\to} \lambda \mathsf{c}.\lambda \mathsf{p}.\mathrm{rule}(\mathsf{c}, \mathsf{p})]$

$[\text{Rule tactic} \overset{\mathrm{tex}}{\to} \text{“}$
Rule\ tactic”]

$[\text{Rule tactic} \overset{\mathrm{pyk}}{\to} \text{“rule tactic”}]$

$\mathrm{Plus}(*, *)$

$[\mathrm{Plus}(\mathsf{a}, \mathsf{b}) \overset{\mathrm{val}}{\to} \mathrm{If}(\mathsf{b}, \mathsf{a}, \mathsf{a} \oplus \mathsf{b})]$

$[\mathrm{Plus}(\mathsf{a}, \mathsf{b}) \overset{\mathrm{tex}}{\to} \text{“}$
Plus(#1.
, #2.
)”]

$[\mathrm{Plus}(\mathsf{a}, \mathsf{b}) \overset{\mathrm{pyk}}{\to} \text{“plus } * \text{ and } * \text{ end plus”}]$

[**Theory** $*$]

$[[\mathbf{Theory}\ \mathsf{n}] \overset{\mathrm{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\mathrm{theory}_2(\mathsf{t}, \mathsf{c})]$

$[[\mathbf{Theory}\ \mathsf{n}] \overset{\mathrm{tex}}{\to} \text{“}$
[\mathbf{Theory\ } #1.
]”]

$[[\mathbf{Theory}\ \mathsf{n}] \overset{\mathrm{pyk}}{\to} \text{“theory } * \text{ end theory”}]$

$\mathrm{theory}_2(*,*)$

$[\mathrm{theory}_2(\mathsf{t},\mathsf{c}) \overset{\mathrm{val}}{\to}$
$\mathrm{let}_1(\lambda \mathsf{n}.$
$\mathrm{let}_1(\lambda \mathsf{s}.$
$\tilde{\mathcal{Q}}(\mathsf{t}, \lceil[\mathsf{n} \overset{\mathrm{stmt}}{\to} \mathsf{x}]\rceil, \mathsf{s}),\ [\ \lceil \mathsf{n} \rceil :: \mathsf{n}\ ]\ ::\ [\ [\ \lceil \mathsf{x} \rceil :: \mathrm{theory}_3(\mathsf{c},\mathsf{n})\ ]\ ::\ \mathsf{T}\ ]\ ), \mathsf{t}^1)]$

$[\mathrm{theory}_2(\mathsf{t},\mathsf{c}) \overset{\mathrm{tex}}{\to}$ “
theory_2(#1.
, #2.
)”]

$[\mathrm{theory}_2(\mathsf{t},\mathsf{c}) \overset{\mathrm{pyk}}{\to}$ “theory two ∗ cache ∗ end theory”]

$\mathrm{theory}_3(*,*)$

$[\mathrm{theory}_3(\mathsf{c},\mathsf{n}) \overset{\mathrm{val}}{\to} \mathsf{n}!$
$\mathrm{let}_1(\lambda \mathsf{r}.$
$\mathrm{theory}_4(\mathsf{c}[\mathsf{r}][\texttt{"codex"}][\mathsf{r}], \mathsf{n}, \mathsf{T}), \mathsf{c}[0])]$

$[\mathrm{theory}_3(\mathsf{c},\mathsf{n}) \overset{\mathrm{tex}}{\to}$ “
theory_3(#1.
, #2.
)”]

$[\mathrm{theory}_3(\mathsf{c},\mathsf{n}) \overset{\mathrm{pyk}}{\to}$ “theory three ∗ name ∗ end theory”]

$\mathrm{theory}_4(*,*,*)$

$[\mathrm{theory}_4(\mathsf{c},\mathsf{n},\mathsf{s}) \overset{\mathrm{val}}{\to} \mathsf{n}!$
$\mathrm{If}(\mathsf{c},\mathsf{s},$
$\mathrm{If}(\neg\ [\ \mathsf{c}^{\mathrm{hc}}\ ]\ , \mathrm{theory}_4(\mathsf{c}^{\mathrm{t}}, \mathsf{n}, \mathrm{theory}_4(\mathsf{c}^{\mathrm{h}}, \mathsf{n}, \mathsf{s})),$
$\mathrm{If}(\neg\ [\ \mathbf{aspect}(<\mathrm{proof}>, \mathsf{c}^{\mathrm{t}})^3 \overset{\mathrm{t}}{=} \lceil \mathrm{Rule\ tactic} \rceil\ ]\ , \mathsf{s},$
$\mathrm{let}_1(\lambda \mathsf{d}.$
$\mathrm{If}(\neg\ [\ \mathsf{d}^1 \overset{\mathrm{t}}{=} \mathsf{n}\ ]\ , \mathsf{s},$
$\mathrm{Plus}(\mathsf{d}^2, \mathsf{s})), \mathbf{aspect}(<\mathrm{stmt}>, \mathsf{c}^{\mathrm{t}})^3))))]$

$[\mathrm{theory}_4(\mathsf{c},\mathsf{n},\mathsf{s}) \overset{\mathrm{tex}}{\to}$ “
theory_4(#1.
, #2.
, #3.
)”]

$[\mathrm{theory}_4(\mathsf{c},\mathsf{n},\mathsf{s}) \overset{\mathrm{pyk}}{\to} \text{“theory four } * \text{ name } * \text{ sum } * \text{ end theory”}]$

HeadNil″

$[\mathrm{HeadNil}'' \overset{\mathrm{proof}}{\to} \text{Rule tactic}]$

$[\mathrm{HeadNil}'' \overset{\mathrm{stmt}}{\to} \mathrm{T}'_{\mathrm{E}} \vdash [\ \mathsf{T}^{\mathrm{h}} = \mathsf{T}\ ]\ ]$

$[\mathrm{HeadNil}'' \overset{\mathrm{tex}}{\to} \text{“}$
HeadNil’’”]

$[\mathrm{HeadNil}'' \overset{\mathrm{pyk}}{\to} \text{“example axiom lemma primed”}]$

HeadPair″

$[\mathrm{HeadPair}'' \overset{\mathrm{proof}}{\to} \text{Rule tactic}]$

$[\mathrm{HeadPair}'' \overset{\mathrm{stmt}}{\to} \mathrm{T}'_{\mathrm{E}} \vdash \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon [\ [\ \underline{\mathsf{a}} :: \underline{\mathsf{b}}\ ]^{\mathrm{h}} = \underline{\mathsf{a}}\ ]\ ]$

$[\mathrm{HeadPair}'' \overset{\mathrm{tex}}{\to} \text{“}$
HeadPair’’”]

$[\mathrm{HeadPair}'' \overset{\mathrm{pyk}}{\to} \text{“example scheme lemma primed”}]$

Transitivity″

$[\mathrm{Transitivity}'' \overset{\mathrm{proof}}{\to} \text{Rule tactic}]$

$[\mathrm{Transitivity}'' \overset{\mathrm{stmt}}{\to} \mathrm{T}'_{\mathrm{E}} \vdash \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon \forall \underline{\mathsf{c}}\colon [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ] \vdash [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{c}}\ ] \vdash [\ \underline{\mathsf{b}} = \underline{\mathsf{c}}\ ]\ ]\ ]\ ]$

$[\mathrm{Transitivity}'' \overset{\mathrm{tex}}{\to} \text{“}$
Transitivity’’”]

$[\mathrm{Transitivity}'' \overset{\mathrm{pyk}}{\to} \text{“example rule lemma primed”}]$

Contra″

$[\mathrm{Contra}'' \overset{\mathrm{proof}}{\to} \text{Rule tactic}]$

$[\mathrm{Contra}'' \overset{\mathrm{stmt}}{\to} \mathrm{T}'_{\mathrm{E}} \vdash [\ [\ [\ \mathsf{T} :: \mathsf{T}\ ] = \mathsf{T}\ ] \vdash \perp\!\!\!\perp\ ]\ ]$

$[\mathrm{Contra}'' \overset{\mathrm{tex}}{\to} \text{“}$
Contra’’”]

$[\mathrm{Contra}'' \overset{\mathrm{pyk}}{\to} \text{“contraexample lemma primed”}]$

HeadNil

[HeadNil $\overset{\text{proof}}{\longrightarrow}$ Rule tactic]

[HeadNil $\overset{\text{stmt}}{\longrightarrow}$ $\mathrm{T_E} \vdash [\ \mathsf{T}^{\mathrm{h}} = \mathsf{T}\ ]$]

[HeadNil $\overset{\text{tex}}{\longrightarrow}$ “
HeadNil”]

[HeadNil $\overset{\text{pyk}}{\longrightarrow}$ “example axiom lemma”]

HeadPair

[HeadPair $\overset{\text{proof}}{\longrightarrow}$ Rule tactic]

[HeadPair $\overset{\text{stmt}}{\longrightarrow}$ $\mathrm{T_E} \vdash \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon [\ [\ \underline{\mathsf{a}} :: \underline{\mathsf{b}}\ ]^{\mathrm{h}} = \underline{\mathsf{a}}\ ]$]

[HeadPair $\overset{\text{tex}}{\longrightarrow}$ “
HeadPair”]

[HeadPair $\overset{\text{pyk}}{\longrightarrow}$ “example scheme lemma”]

Transitivity

[Transitivity $\overset{\text{proof}}{\longrightarrow}$ Rule tactic]

[Transitivity $\overset{\text{stmt}}{\longrightarrow}$ $\mathrm{T_E} \vdash \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon \forall \underline{\mathsf{c}}\colon [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ] \vdash [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{c}}\ ] \vdash [\ \underline{\mathsf{b}} = \underline{\mathsf{c}}\ ]\ ]\ ]$]

[Transitivity $\overset{\text{tex}}{\longrightarrow}$ “
Transitivity”]

[Transitivity $\overset{\text{pyk}}{\longrightarrow}$ “example rule lemma”]

Contra

[Contra $\overset{\text{proof}}{\longrightarrow}$ Rule tactic]

[Contra $\overset{\text{stmt}}{\longrightarrow}$ $\mathrm{T_E} \vdash [\ [\ [\ \mathsf{T} :: \mathsf{T}\ ] = \mathsf{T}\ ] \vdash \perp\!\!\!\perp\ ]$]

[Contra $\overset{\text{tex}}{\longrightarrow}$ “
Contra”]

[Contra $\overset{\text{pyk}}{\longrightarrow}$ “contraexample lemma”]

$\mathrm{T_E}$

$[\mathrm{T_E} \overset{\mathrm{stmt}}{\to} [\ [\ [\ \mathsf{T} :: \mathsf{T}\ ] = \mathsf{T}\ ] \vdash \perp\!\!\!\perp\ ] \oplus [\ [\ \forall \underline{\mathsf{a}} \colon \forall \underline{\mathsf{b}} \colon [\ [\ \underline{\mathsf{a}} :: \underline{\mathsf{b}}\ ]^{\mathrm{h}} = \underline{\mathsf{a}}\ ]\ ] \oplus [\ [\ \forall \underline{\mathsf{a}} \colon \forall \underline{\mathsf{b}} \colon \forall \underline{\mathsf{c}} \colon [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ] \vdash [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{c}}\ ] \vdash [\ \underline{\mathsf{b}} = \underline{\mathsf{c}}\ ]\ ]\ ]\ ]\ ] \oplus [\ \mathsf{T}^{\mathrm{h}} = \mathsf{T}\ ]\ ]\ ]\ ]$

$[\mathrm{T_E} \overset{\mathrm{tex}}{\to} \text{“}$
$\mathrm{T\_E}\text{”}]$

$[\mathrm{T_E} \overset{\mathrm{pyk}}{\to} \text{“example theory”}]$

ragged right

[ragged right $\overset{\mathrm{name}}{\to}$ “
ragged\ right”]

[ragged right $\overset{\mathrm{tex}}{\to}$ “
\raggedright”]

[ragged right $\overset{\mathrm{pyk}}{\to}$ “ragged right”]

ragged right expansion

[ragged right expansion $\overset{\mathrm{name}}{\to}$ “
ragged\ right\ expansion\ ”]

[ragged right expansion $\overset{\mathrm{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[\text{ragged right expansion}\ \ddot{=}$
ragged right]⌉)]

[ragged right expansion $\overset{\mathrm{tex}}{\to}$ “”]

[ragged right expansion $\overset{\mathrm{pyk}}{\to}$ “ragged right expansion”]

$\mathrm{parm}(*, *, *)$

$[\mathrm{parm}(\mathsf{t}, \mathsf{s}, \mathsf{n}) \overset{\mathrm{val}}{\to} \mathsf{n}!$
$\mathrm{If}(\mathsf{t} \overset{\mathrm{r}}{=} \lceil \forall \mathsf{x} \colon \mathsf{y} \rceil, \forall \mathsf{n} \colon \mathrm{parm}(\mathsf{t}^2,\ [\ \mathsf{t}^1 :: \mathsf{n}\ ] :: \mathsf{s}, \mathsf{T} + 2 * \mathsf{n}),$
$\mathrm{let}_1(\lambda \mathsf{m}.$
$\mathrm{If}(\neg \mathsf{m}, \mathsf{m}, \mathsf{t}^{\mathrm{R}} :: \mathrm{parm}^*(\mathsf{t}^{\mathrm{t}}, \mathsf{s}, \mathsf{n})), \mathbf{lookup}(\mathsf{t}, \mathsf{s}, \mathsf{T})))]$

$[\mathrm{parm}(\mathsf{t}, \mathsf{s}, \mathsf{n}) \overset{\mathrm{tex}}{\to} \text{“}$
$\mathrm{parm}(\#1.$
$, \#2.$
$, \#3.$
$)\text{”}]$

$[\mathrm{parm}(\mathsf{t},\mathsf{s},\mathsf{n}) \overset{\mathrm{pyk}}{\to} \text{“parameter term } * \text{ stack } * \text{ seed } * \text{ end parameter”}]$

$\mathrm{parm}^*(*,*,*)$

$[\mathrm{parm}^*(\mathsf{t},\mathsf{s},\mathsf{n}) \overset{\mathrm{val}}{\to} \mathsf{s}!\ [\ \mathsf{n}!\mathrm{If}(\mathsf{t}^{\mathrm{a}}, \mathsf{T}, \mathrm{parm}(\mathsf{t}^{\mathrm{h}},\mathsf{s},\mathsf{n}) :: \mathrm{parm}^*(\mathsf{t}^{\mathrm{t}},\mathsf{s},\mathsf{n}))\ ]\ ]$

$[\mathrm{parm}^*(\mathsf{t},\mathsf{s},\mathsf{n}) \overset{\mathrm{tex}}{\to} \text{“}$
parmˆ∗(#1.
,#2.
,#3.
)”]

$[\mathrm{parm}^*(\mathsf{t},\mathsf{s},\mathsf{n}) \overset{\mathrm{pyk}}{\to} \text{“parameter term star } * \text{ stack } * \text{ seed } * \text{ end parameter”}]$

$\mathrm{inst}(*,*)$

$[\mathrm{inst}(\mathsf{t},\mathsf{s}) \overset{\mathrm{val}}{\to} \mathrm{If}(\mathsf{t}^{\mathrm{c}}, \mathrm{inst}(\mathsf{s}[\mathsf{t}],\mathsf{s}), \mathsf{t}^{\mathrm{R}} :: \mathrm{inst}^*(\mathsf{t}^{\mathrm{t}},\mathsf{s}))]$

$[\mathrm{inst}(\mathsf{t},\mathsf{s}) \overset{\mathrm{tex}}{\to} \text{“}$
inst(#1.
,#2.
)”]

$[\mathrm{inst}(\mathsf{t},\mathsf{s}) \overset{\mathrm{pyk}}{\to} \text{“instantiate } * \text{ with } * \text{ end instantiate”}]$

$\mathrm{inst}^*(*,*)$

$[\mathrm{inst}^*(\mathsf{t},\mathsf{s}) \overset{\mathrm{val}}{\to} \mathsf{s}!\mathrm{If}(\mathsf{t}^{\mathrm{a}}, \mathsf{T}, \mathrm{inst}(\mathsf{t}^{\mathrm{h}},\mathsf{s}) :: \mathrm{inst}^*(\mathsf{t}^{\mathrm{t}},\mathsf{s}))]$

$[\mathrm{inst}^*(\mathsf{t},\mathsf{s}) \overset{\mathrm{tex}}{\to} \text{“}$
instˆ∗(#1.
,#2.
)”]

$[\mathrm{inst}^*(\mathsf{t},\mathsf{s}) \overset{\mathrm{pyk}}{\to} \text{“instantiate star } * \text{ with } * \text{ end instantiate”}]$

$\mathrm{occur}(*,*,*)$

$[\mathrm{occur}(\mathsf{t},\mathsf{u},\mathsf{s}) \overset{\mathrm{val}}{\to} \mathsf{s}!\mathrm{If}(\mathsf{u}^{\mathrm{c}}, \mathrm{If}(\mathsf{t} \approx \mathsf{u}, \mathsf{T}, \mathrm{occur}(\mathsf{t},\mathsf{s}[\mathsf{u}],\mathsf{s})), \mathrm{occur}^*(\mathsf{t},\mathsf{u}^{\mathrm{t}},\mathsf{s}))]$

$[\mathrm{occur}(\mathsf{t},\mathsf{u},\mathsf{s}) \overset{\mathrm{tex}}{\to} \text{“}$
occur(#1.

, #2.
, #3.
)”]

[occur(t, u, s) $\overset{\text{pyk}}{\to}$ “occur ∗ in ∗ substitution ∗ end occur”]

occur*(∗, ∗, ∗)

[occur*(t, u, s) $\overset{\text{val}}{\to}$ t! [s!If(u^a, F, If(occur(t, u^h, s), T, occur*(t, u^t, s)))]]

[occur*(t, u, s) $\overset{\text{tex}}{\to}$ “
occur^∗(#1.
, #2.
, #3.
)”]

[occur*(t, u, s) $\overset{\text{pyk}}{\to}$ “occur star ∗ in ∗ substitution ∗ end occur”]

unify(∗ = ∗, ∗)

[unify(t = u, s) $\overset{\text{val}}{\to}$ t! [u!
If(s^c, s,
If(t^c, unify_2(t = u, s),
If(u^c, unify_2(u = t, s),
If(t $\overset{r}{=}$ u, unify*(t^t = u^t, s), 0))))]]

[unify(t = u, s) $\overset{\text{tex}}{\to}$ “
unify(#1.
=#2.
, #3.
)”]

[unify(t = u, s) $\overset{\text{pyk}}{\to}$ “unify ∗ with ∗ substitution ∗ end unify”]

unify*(∗ = ∗, ∗)

[unify*(t = u, s) $\overset{\text{val}}{\to}$ u!If(t^a, s, unify*(t^t = u^t, unify(t^h = u^h, s)))]

[unify*(t = u, s) $\overset{\text{tex}}{\to}$ “
unify^∗(#1.
=#2.
, #3.
)”]

$[\mathrm{unify}^*(\mathsf{t}=\mathsf{u},\mathsf{s}) \overset{\mathrm{pyk}}{\to} \text{“unify star } * \text{ with } * \text{ substitution } * \text{ end unify”}]$

$\mathrm{unify}_2(*=*,*)$

$[\mathrm{unify}_2(\mathsf{t}=\mathsf{u},\mathsf{s}) \overset{\mathrm{val}}{\to}$
$\mathrm{If}(\mathsf{t}\approx\mathsf{u},\mathsf{s},$
$\mathrm{let}_1(\lambda\mathsf{t}'.$
$\mathrm{If}(\neg\,[\,\mathsf{t}'\,]\,,\mathrm{unify}(\mathsf{t}'=\mathsf{u},\mathsf{s}),$
$\mathrm{If}(\mathrm{occur}(\mathsf{t},\mathsf{u},\mathsf{s}),0,\mathsf{s}[\mathsf{t}{\to}\mathsf{u}])),\mathsf{s}[\mathsf{t}]))]$

$[\mathrm{unify}_2(\mathsf{t}=\mathsf{u},\mathsf{s}) \overset{\mathrm{tex}}{\to}$ “
unify_2(#1.
=#2.
,#3.
)”]

$[\mathrm{unify}_2(\mathsf{t}=\mathsf{u},\mathsf{s}) \overset{\mathrm{pyk}}{\to} \text{“unify two } * \text{ with } * \text{ substitution } * \text{ end unify”}]$

$\mathrm{L_a}$

$[\mathrm{L_a} \overset{\mathrm{name}}{\to} \text{“L_a”}]$

$[\mathrm{L_a} \overset{\mathrm{tex}}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_a \else
\if \relax \csname lgwella\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwella {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwella \fi ”]

$[\mathrm{L_a} \overset{\mathrm{pyk}}{\to} \text{“ell a”}]$

$\mathrm{L_b}$

$[\mathrm{L_b} \overset{\mathrm{name}}{\to} \text{“L_b”}]$

$[\mathrm{L_b} \overset{\mathrm{tex}}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_b \else
\if \relax \csname lgwellb\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellb {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellb \fi ”]

$[\mathrm{L_b} \overset{\mathrm{pyk}}{\to} \text{“ell b”}]$

L_c

$[L_c \overset{\text{name}}{\to} \text{“L\_c”}]$

$[L_c \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_c \else
\if \relax \csname lgwellc\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellc {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellc \fi ”]

$[L_c \overset{\text{pyk}}{\to} \text{“ell c”}]$

L_d

$[L_d \overset{\text{name}}{\to} \text{“L\_d”}]$

$[L_d \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_d \else
\if \relax \csname lgwelld\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwelld {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwelld \fi ”]

$[L_d \overset{\text{pyk}}{\to} \text{“ell d”}]$

L_e

$[L_e \overset{\text{name}}{\to} \text{“L\_e”}]$

$[L_e \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_e \else
\if \relax \csname lgwelle\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwelle {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwelle \fi ”]

$[L_e \overset{\text{pyk}}{\to} \text{“ell e”}]$

L_f

$[L_f \overset{\text{name}}{\to} \text{“L\_f”}]$

$[L_f \overset{\text{tex}}{\to} \text{“}$

\if \relax \csname lgwprooflinep\endcsname L_f \else
\if \relax \csname lgwellf\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellf {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellf \fi "]

[$L_f \overset{pyk}{\to}$ "ell f"]

L_g

[$L_g \overset{name}{\to}$ "L_g"]

[$L_g \overset{tex}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_g \else
\if \relax \csname lgwellg\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellg {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellg \fi "]

[$L_g \overset{pyk}{\to}$ "ell g"]

L_h

[$L_h \overset{name}{\to}$ "L_h"]

[$L_h \overset{tex}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_h \else
\if \relax \csname lgwellh\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellh {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellh \fi "]

[$L_h \overset{pyk}{\to}$ "ell h"]

L_i

[$L_i \overset{name}{\to}$ "L_i"]

[$L_i \overset{tex}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_i \else
\if \relax \csname lgwelli\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwelli {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwelli \fi "]

[$L_i \overset{pyk}{\to}$ “ell i”]

L_j

[$L_j \overset{name}{\to}$ “L_j”]

[$L_j \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_j \else
\if \relax \csname lgwellj\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellj {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellj \fi ”]

[$L_j \overset{pyk}{\to}$ “ell j”]

L_k

[$L_k \overset{name}{\to}$ “L_k”]

[$L_k \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_k \else
\if \relax \csname lgwellk\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellk {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellk \fi ”]

[$L_k \overset{pyk}{\to}$ “ell k”]

L_l

[$L_l \overset{name}{\to}$ “L_l”]

[$L_l \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_l \else
\if \relax \csname lgwelll\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwelll {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwelll \fi ”]

[$L_l \overset{pyk}{\to}$ “ell l”]

L_m

$[L_m \overset{\text{name}}{\rightarrow} \text{“L\_m”}]$

$[L_m \overset{\text{tex}}{\rightarrow} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_m \else
\if \relax \csname lgwellm\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellm {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellm \fi ”]

$[L_m \overset{\text{pyk}}{\rightarrow} \text{“ell m”}]$

L_n

$[L_n \overset{\text{name}}{\rightarrow} \text{“L\_n”}]$

$[L_n \overset{\text{tex}}{\rightarrow} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_n \else
\if \relax \csname lgwelln\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwelln {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwelln \fi ”]

$[L_n \overset{\text{pyk}}{\rightarrow} \text{“ell n”}]$

L_o

$[L_o \overset{\text{name}}{\rightarrow} \text{“L\_o”}]$

$[L_o \overset{\text{tex}}{\rightarrow} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_o \else
\if \relax \csname lgwello\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwello \fi ”]

$[L_o \overset{\text{pyk}}{\rightarrow} \text{“ell o”}]$

L_p

$[L_p \overset{\text{name}}{\rightarrow} \text{“L\_p”}]$

$[L_p \overset{\text{tex}}{\rightarrow} \text{“}$

\if \relax \csname lgwprooflinep\endcsname L_p \else
\if \relax \csname lgwellp\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellp {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellp \fi "]

[$L_p \overset{pyk}{\to}$ "ell p"]

L_q

[$L_q \overset{name}{\to}$ "L_q"]

[$L_q \overset{tex}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_q \else
\if \relax \csname lgwellq\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellq {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellq \fi "]

[$L_q \overset{pyk}{\to}$ "ell q"]

L_r

[$L_r \overset{name}{\to}$ "L_r"]

[$L_r \overset{tex}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_r \else
\if \relax \csname lgwellr\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellr {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellr \fi "]

[$L_r \overset{pyk}{\to}$ "ell r"]

L_s

[$L_s \overset{name}{\to}$ "L_s"]

[$L_s \overset{tex}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_s \else
\if \relax \csname lgwells\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwells {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwells \fi "]

[$L_s \overset{\text{pyk}}{\to}$ “ell s”]

L_t

[$L_t \overset{\text{name}}{\to}$ “L_t”]

[$L_t \overset{\text{tex}}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_t \else
\if \relax \csname lgwellt\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellt {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellt \fi ”]

[$L_t \overset{\text{pyk}}{\to}$ “ell t”]

L_u

[$L_u \overset{\text{name}}{\to}$ “L_u”]

[$L_u \overset{\text{tex}}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_u \else
\if \relax \csname lgwellu\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellu {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellu \fi ”]

[$L_u \overset{\text{pyk}}{\to}$ “ell u”]

L_v

[$L_v \overset{\text{name}}{\to}$ “L_v”]

[$L_v \overset{\text{tex}}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_v \else
\if \relax \csname lgwellv\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellv {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellv \fi ”]

[$L_v \overset{\text{pyk}}{\to}$ “ell v”]

L_w

$[L_w \overset{\text{name}}{\rightarrow} \text{“L\_w”}]$

$[L_w \overset{\text{tex}}{\rightarrow} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_w \else
\if \relax \csname lgwellw\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellw {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellw \fi ”]

$[L_w \overset{\text{pyk}}{\rightarrow} \text{“ell w”}]$

L_x

$[L_x \overset{\text{name}}{\rightarrow} \text{“L\_x”}]$

$[L_x \overset{\text{tex}}{\rightarrow} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_x \else
\if \relax \csname lgwellx\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellx {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellx \fi ”]

$[L_x \overset{\text{pyk}}{\rightarrow} \text{“ell x”}]$

L_y

$[L_y \overset{\text{name}}{\rightarrow} \text{“L\_y”}]$

$[L_y \overset{\text{tex}}{\rightarrow} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_y \else
\if \relax \csname lgwelly\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwelly {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwelly \fi ”]

$[L_y \overset{\text{pyk}}{\rightarrow} \text{“ell y”}]$

L_z

$[L_z \overset{\text{name}}{\rightarrow} \text{“L\_z”}]$

$[L_z \overset{\text{tex}}{\rightarrow} \text{“}$

\if \relax \csname lgwprooflinep\endcsname L_z \else
\if \relax \csname lgwellz\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellz {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellz \fi "]

[$L_z \overset{\text{pyk}}{\to}$ "ell z"]

L_A

[$L_A \overset{\text{name}}{\to}$ "L_A"]

[$L_A \overset{\text{tex}}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_A \else
\if \relax \csname lgwellbiga\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbiga {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbiga \fi "]

[$L_A \overset{\text{pyk}}{\to}$ "ell big a"]

L_B

[$L_B \overset{\text{name}}{\to}$ "L_B"]

[$L_B \overset{\text{tex}}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_B \else
\if \relax \csname lgwellbigb\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigb {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigb \fi "]

[$L_B \overset{\text{pyk}}{\to}$ "ell big b"]

L_C

[$L_C \overset{\text{name}}{\to}$ "L_C"]

[$L_C \overset{\text{tex}}{\to}$ "
\if \relax \csname lgwprooflinep\endcsname L_C \else
\if \relax \csname lgwellbigc\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigc {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigc \fi "]

[$L_C \overset{pyk}{\to}$ “ell big c”]

L_D

[$L_D \overset{name}{\to}$ “L_D”]

[$L_D \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_D \else
\if \relax \csname lgwellbigd\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigd {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigd \fi ”]

[$L_D \overset{pyk}{\to}$ “ell big d”]

L_E

[$L_E \overset{name}{\to}$ “L_E”]

[$L_E \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_E \else
\if \relax \csname lgwellbige\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbige {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbige \fi ”]

[$L_E \overset{pyk}{\to}$ “ell big e”]

L_F

[$L_F \overset{name}{\to}$ “L_F”]

[$L_F \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_F \else
\if \relax \csname lgwellbigf\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigf {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigf \fi ”]

[$L_F \overset{pyk}{\to}$ “ell big f”]

L_G

$[L_G \overset{\text{name}}{\to} \text{“L\_G”}]$

$[L_G \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_G \else
\if \relax \csname lgwellbigg\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigg {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigg \fi ”]

$[L_G \overset{\text{pyk}}{\to} \text{“ell big g”}]$

L_H

$[L_H \overset{\text{name}}{\to} \text{“L\_H”}]$

$[L_H \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_H \else
\if \relax \csname lgwellbigh\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigh {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigh \fi ”]

$[L_H \overset{\text{pyk}}{\to} \text{“ell big h”}]$

L_I

$[L_I \overset{\text{name}}{\to} \text{“L\_I”}]$

$[L_I \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_I \else
\if \relax \csname lgwellbigi\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigi {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigi \fi ”]

$[L_I \overset{\text{pyk}}{\to} \text{“ell big i”}]$

L_J

$[L_J \overset{\text{name}}{\to} \text{“L\_J”}]$

$[L_J \overset{\text{tex}}{\to} \text{“}$

\if \relax \csname lgwprooflinep\endcsname L_J \else
\if \relax \csname lgwellbigj\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigj {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigj \fi ”]

[$L_J \overset{pyk}{\to}$ “ell big j”]

L_K

[$L_K \overset{name}{\to}$ “L_K”]

[$L_K \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_K \else
\if \relax \csname lgwellbigk\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigk {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigk \fi ”]

[$L_K \overset{pyk}{\to}$ “ell big k”]

L_L

[$L_L \overset{name}{\to}$ “L_L”]

[$L_L \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_L \else
\if \relax \csname lgwellbigl\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigl {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigl \fi ”]

[$L_L \overset{pyk}{\to}$ “ell big l”]

L_M

[$L_M \overset{name}{\to}$ “L_M”]

[$L_M \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_M \else
\if \relax \csname lgwellbigm\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigm {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigm \fi ”]

[$L_M \overset{pyk}{\to}$ “ell big m”]

L_N

[$L_N \overset{name}{\to}$ “L_N”]

[$L_N \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_N \else
\if \relax \csname lgwellbign\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbign {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbign \fi ”]

[$L_N \overset{pyk}{\to}$ “ell big n”]

L_O

[$L_O \overset{name}{\to}$ “L_O”]

[$L_O \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_O \else
\if \relax \csname lgwellbigo\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigo {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigo \fi ”]

[$L_O \overset{pyk}{\to}$ “ell big o”]

L_P

[$L_P \overset{name}{\to}$ “L_P”]

[$L_P \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_P \else
\if \relax \csname lgwellbigp\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigp {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigp \fi ”]

[$L_P \overset{pyk}{\to}$ “ell big p”]

L_Q

$[L_Q \overset{\text{name}}{\to} \text{“L\_Q”}]$

$[L_Q \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_Q \else
\if \relax \csname lgwellbigq\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigq {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigq \fi ”]

$[L_Q \overset{\text{pyk}}{\to} \text{“ell big q”}]$

L_R

$[L_R \overset{\text{name}}{\to} \text{“L\_R”}]$

$[L_R \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_R \else
\if \relax \csname lgwellbigr\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigr {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigr \fi ”]

$[L_R \overset{\text{pyk}}{\to} \text{“ell big r”}]$

L_S

$[L_S \overset{\text{name}}{\to} \text{“L\_S”}]$

$[L_S \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_S \else
\if \relax \csname lgwellbigs\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigs {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigs \fi ”]

$[L_S \overset{\text{pyk}}{\to} \text{“ell big s”}]$

L_T

$[L_T \overset{\text{name}}{\to} \text{“L\_T”}]$

$[L_T \overset{\text{tex}}{\to} \text{“}$

\if \relax \csname lgwprooflinep\endcsname L_T \else
\if \relax \csname lgwellbigt\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigt {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigt \fi ”]

[$L_T \overset{pyk}{\to}$ “ell big t”]

L_U

[$L_U \overset{name}{\to}$ “L_U”]

[$L_U \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_U \else
\if \relax \csname lgwellbigu\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigu {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigu \fi ”]

[$L_U \overset{pyk}{\to}$ “ell big u”]

L_V

[$L_V \overset{name}{\to}$ “L_V”]

[$L_V \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_V \else
\if \relax \csname lgwellbigv\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigv {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigv \fi ”]

[$L_V \overset{pyk}{\to}$ “ell big v”]

L_W

[$L_W \overset{name}{\to}$ “L_W”]

[$L_W \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_W \else
\if \relax \csname lgwellbigw\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigw {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigw \fi ”]

[$L_W \overset{pyk}{\to}$ “ell big w”]

L_X

[$L_X \overset{name}{\to}$ “L_X”]

[$L_X \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_X \else
\if \relax \csname lgwellbigx\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigx {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigx \fi ”]

[$L_X \overset{pyk}{\to}$ “ell big x”]

L_Y

[$L_Y \overset{name}{\to}$ “L_Y”]

[$L_Y \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_Y \else
\if \relax \csname lgwellbigy\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigy {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigy \fi ”]

[$L_Y \overset{pyk}{\to}$ “ell big y”]

L_Z

[$L_Z \overset{name}{\to}$ “L_Z”]

[$L_Z \overset{tex}{\to}$ “
\if \relax \csname lgwprooflinep\endcsname L_Z \else
\if \relax \csname lgwellbigz\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwellbigz {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwellbigz \fi ”]

[$L_Z \overset{pyk}{\to}$ “ell big z”]

$\mathrm{L}_?$

$[\mathrm{L}_? \overset{\text{name}}{\to} \text{“L\_?”}]$

$[\mathrm{L}_? \overset{\text{tex}}{\to} \text{“}$
\if \relax \csname lgwprooflinep\endcsname L_? \else
\global \advance \lgwproofline by 1
L\ifnum \lgwproofline <10 0\fi \number \lgwproofline
\fi ”]

$[\mathrm{L}_? \overset{\text{pyk}}{\to} \text{“ell dummy”}]$

Reflexivity

$[\text{Reflexivity} \overset{\text{proof}}{\to} \lceil \mathrm{T_E} \vdash \forall \underline{a}\colon [\ [\ [\ \text{HeadPair}^{\mathrm{I}\triangleright *\triangleright} \mathbin{@} \underline{a}\ ]\ \mathbin{@} \underline{a}\ ]\ ;\ [\ [\ [\ [\ \text{Transitivity}^{\mathrm{I}\triangleright *\triangleright} \mathbin{@} [\ [\ \underline{a} :: \underline{a}\ ]^{\,\mathrm{h}}\ ]\ ]\ \mathbin{@} \underline{a}\ ]\ \mathbin{@} \underline{a}\ ]^{\,\triangleright\triangleright}\ ]\ ]\ ]\rceil]$

$[\text{Reflexivity} \overset{\text{stmt}}{\to} \mathrm{T_E} \vdash \forall \underline{a}\colon [\ \underline{a} = \underline{a}\ ]\ ]$

$[\text{Reflexivity} \overset{\text{tex}}{\to} \text{“}$
Reflexivity”]

$[\text{Reflexivity} \overset{\text{pyk}}{\to} \text{“sequent reflexivity”}]$

Reflexivity_1

$[\text{Reflexivity}_1 \overset{\text{proof}}{\to} \lambda \mathsf{c}.\lambda \mathsf{x}.\mathcal{P}(\lceil \mathrm{T_E} \vdash \forall \underline{a}\colon [\ [\ \text{HeadPair} \gg [\ [\ \underline{a} :: \underline{a}\ ]^{\,\mathrm{h}} = \underline{a}\ ]\ ]\ ;\ [\ [\ [\ \text{Transitivity} \triangleright [\ [\ \underline{a} :: \underline{a}\ ]^{\,\mathrm{h}} = \underline{a}\ ]\ ]\ \triangleright [\ [\ \underline{a} :: \underline{a}\ ]^{\,\mathrm{h}} = \underline{a}\ ]\ ]\ \gg [\ \underline{a} = \underline{a}\ ]\ ]\ ]\rceil, \mathrm{p}_0, \mathsf{c})]$

$[\text{Reflexivity}_1 \overset{\text{stmt}}{\to} \mathrm{T_E} \vdash \forall \underline{a}\colon [\ \underline{a} = \underline{a}\ ]\ ]$

$[\text{Reflexivity}_1 \overset{\text{tex}}{\to} \text{“}$
Reflexivity_1”]

$[\text{Reflexivity}_1 \overset{\text{pyk}}{\to} \text{“tactic reflexivity”}]$

Commutativity

$[\text{Commutativity} \overset{\text{proof}}{\to} \lceil \mathrm{T_E} \vdash \forall \underline{a}\colon \forall \underline{b}\colon [\ [\ \underline{a} = \underline{b}\ ]\ \vdash\ [\ [\ \text{Reflexivity}^{\mathrm{I}\triangleright *\triangleright} \mathbin{@} \underline{a}\ ]\ ;\ [\ [\ [\ [\ \text{Transitivity}^{\mathrm{I}\triangleright *\triangleright} \mathbin{@} \underline{a}\ ]\ \mathbin{@} \underline{b}\ ]\ \mathbin{@} \underline{a}\ ]^{\,\triangleright\triangleright}\ ]\ ]\ ]\rceil]$

$[\text{Commutativity} \overset{\text{stmt}}{\to} \mathrm{T_E} \vdash \forall \underline{a}\colon \forall \underline{b}\colon [\ [\ \underline{a} = \underline{b}\ ]\ \vdash\ [\ \underline{b} = \underline{a}\ ]\ ]\ ]$

$[\text{Commutativity} \overset{\text{tex}}{\to} \text{“}$
$\text{Commutativity”}]$

$[\text{Commutativity} \overset{\text{pyk}}{\to} \text{“sequent commutativity”}]$

Commutativity_1

$[\text{Commutativity}_1 \overset{\text{proof}}{\to} \lambda \mathsf{c}.\lambda \mathsf{x}.\mathcal{P}(\lceil \mathrm{T_E} \vdash \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ]\ \vdash\ [\ [\ \text{Reflexivity}_1 \gg [\ \underline{\mathsf{a}} = \underline{\mathsf{a}}\ ]\ ]\ ;\ [\ [\ [\ \text{Transitivity} \rhd [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ]\ ] \rhd [\ \underline{\mathsf{a}} = \underline{\mathsf{a}}\ ]\ ] \gg [\ \underline{\mathsf{b}} = \underline{\mathsf{a}}\ ]\ ]\ ]\ ]\ \rceil, \mathrm{p}_0, \mathsf{c})]$

$[\text{Commutativity}_1 \overset{\text{stmt}}{\to} \mathrm{T_E} \vdash \forall \underline{\mathsf{a}}\colon \forall \underline{\mathsf{b}}\colon [\ [\ \underline{\mathsf{a}} = \underline{\mathsf{b}}\ ]\ \vdash\ [\ \underline{\mathsf{b}} = \underline{\mathsf{a}}\ ]\ ]\ ]$

$[\text{Commutativity}_1 \overset{\text{tex}}{\to} \text{“}$
$\text{Commutativity\_1”}]$

$[\text{Commutativity}_1 \overset{\text{pyk}}{\to} \text{“tactic commutativity”}]$

<tactic>

$[\text{<tactic>} \overset{\text{val}}{\to} \lceil \text{<tactic>} \rceil]$

$[\text{<tactic>} \overset{\text{tex}}{\to} \text{“}$
$\{<\}\text{tactic}\{>\}\text{”}]$

$[\text{<tactic>} \overset{\text{pyk}}{\to} \text{“the tactic aspect”}]$

tactic

$[\text{tactic} \overset{\text{msg}}{\to} \text{<tactic>}]$

$[\text{tactic} \overset{\text{tex}}{\to} \text{“}$
$\text{tactic”}]$

$[\text{tactic} \overset{\text{pyk}}{\to} \text{“tactic”}]$

$\left[* \overset{\text{tactic}}{=\!=} *\right]$

$[[\mathsf{x} \overset{\text{tactic}}{=\!=} \mathsf{y}] \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil [[\mathsf{x} \overset{\text{tactic}}{=\!=} \mathsf{y}] \doteq [(\mathsf{x})^{\mathbf{p}} \overset{\text{tactic}}{\to} \mathsf{y}]] \rceil)]$

$[[\mathsf{x} \overset{\text{tactic}}{=\!=} \mathsf{y}] \overset{\text{tex}}{\to} \text{“}$
[#1/tex name/tex.

\stackrel {tactic}{=}#2.
]”]

[[x $\overset{\text{tactic}}{=}$ y] $\overset{\text{pyk}}{\to}$ “tactic define ∗ as ∗ end define”]

$\mathcal{P}(*, *, *)$

[$\mathcal{P}(\mathsf{t}, \mathsf{s}, \mathsf{c}) \overset{\text{val}}{\to} \mathsf{s}!$
$\text{let}_1(\lambda \mathsf{d}.$
$\text{If}(\mathsf{d}, \mathsf{t}^{\text{h}} :: \mathcal{P}^*(\mathsf{t}^{\text{t}}, \mathsf{s}, \mathsf{c}),$
$\mathcal{U}^{\text{M}}($ [[$\mathcal{E}(\mathsf{d}^3, \mathsf{T}, \mathsf{c})$ ‘ t] ‘ s] ‘ c)), **aspect**(<tactic>, t, c))]

[$\mathcal{P}(\mathsf{t}, \mathsf{s}, \mathsf{c}) \overset{\text{tex}}{\to}$ “
{\cal P}(#1.
, #2.
, #3.
)”]

[$\mathcal{P}(\mathsf{t}, \mathsf{s}, \mathsf{c}) \overset{\text{pyk}}{\to}$ “proof expand ∗ state ∗ cache ∗ end expand”]

$\mathcal{P}^*(*, *, *)$

[$\mathcal{P}^*(\mathsf{t}, \mathsf{s}, \mathsf{c}) \overset{\text{val}}{\to} \mathsf{s}!$ [c!If(t, T, $\mathcal{P}(\mathsf{t}^{\text{h}}, \mathsf{s}, \mathsf{c}) :: \mathcal{P}^*(\mathsf{t}^{\text{t}}, \mathsf{s}, \mathsf{c})$)]]

[$\mathcal{P}^*(\mathsf{t}, \mathsf{s}, \mathsf{c}) \overset{\text{tex}}{\to}$ “
{\cal P}^*(#1.
, #2.
, #3.
)”]

[$\mathcal{P}^*(\mathsf{t}, \mathsf{s}, \mathsf{c}) \overset{\text{pyk}}{\to}$ “proof expand list ∗ state ∗ cache ∗ end expand”]

p_0

[$\mathrm{p}_0 \overset{\text{val}}{\to} \mathcal{M}(\lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\mathcal{P}(\mathsf{t}, \mathsf{s}, \mathsf{c})) :: \mathsf{T}$]

[$\mathrm{p}_0 \overset{\text{tex}}{\to}$ “
p_0”]

[$\mathrm{p}_0 \overset{\text{pyk}}{\to}$ “proof state”]

$\mathrm{conclude}_1(*,*)$

$[\mathrm{conclude}_1(\mathsf{t},\mathsf{c}) \overset{\mathrm{val}}{\to}$
$\mathrm{let}_1(\lambda \mathsf{r}.$
$\mathrm{If}(\mathsf{r}^{\mathsf{c}}, \mathrm{error}_2(\lceil \text{“Unification failed”} \rceil, \mathsf{t}), \mathsf{r}), \mathrm{conclude}_2(\mathsf{t}^1, \mathsf{t}^2, \mathsf{c}))]$

$[\mathrm{conclude}_1(\mathsf{t},\mathsf{c}) \overset{\mathrm{tex}}{\to}$ “
conclude_1 (#1.
, #2.
)”]

$[\mathrm{conclude}_1(\mathsf{t},\mathsf{c}) \overset{\mathrm{pyk}}{\to}$ “conclude one $*$ cache $*$ end conclude”]

$\mathrm{conclude}_2(*,*,*)$

$[\mathrm{conclude}_2(\mathsf{a},\mathsf{t},\mathsf{c}) \overset{\mathrm{val}}{\to} \mathsf{t}!$
$\mathrm{If}(\mathsf{a} \overset{\mathrm{r}}{=} \lceil \mathsf{x} \rhd \mathsf{y} \rceil, \mathrm{conclude}_2(\mathsf{a}^1, \mathsf{a\text{-}color}(\mathsf{t} \rhd \ [\ \mathsf{a}^2\ ]\ ), \mathsf{c}),$
$\mathrm{If}(\mathsf{a} \overset{\mathrm{r}}{=} \lceil \mathsf{x} \Rrightarrow \mathsf{y} \rceil, \mathrm{conclude}_2(\mathsf{a}^1, \mathsf{a\text{-}color}(\mathsf{t} \Rrightarrow \ [\ \mathsf{a}^2\ ]\ ), \mathsf{c}),$
$\mathrm{If}(\mathsf{a} \overset{\mathrm{r}}{=} \lceil \mathsf{x} @ \mathsf{y} \rceil, \mathrm{conclude}_2(\mathsf{a}^1, \mathsf{a\text{-}color}(\mathsf{t} @ \ [\ \mathsf{a}^2\ ]\ ), \mathsf{c}),$
$\mathrm{If}(\mathbf{aspect}(\langle \text{proof} \rangle, \mathsf{a}, \mathsf{c}), \mathrm{error}_2(\lceil \text{“Lemma expected”} \rceil, \mathsf{a}),$
$\mathrm{let}_1(\lambda \mathsf{d}.$
$\mathrm{conclude}_3(\mathsf{a}^{\mathrm{I} \rhd * \rhd}, \mathsf{t}, \mathrm{parm}(\mathsf{d}^{32}, \mathsf{T}, 1), \mathsf{T}), \mathbf{aspect}(\langle \text{stmt} \rangle, \mathsf{a}, \mathsf{c}))))))]$

$[\mathrm{conclude}_2(\mathsf{a},\mathsf{t},\mathsf{c}) \overset{\mathrm{tex}}{\to}$ “
conclude_2 (#1.
, #2.
, #3.
)”]

$[\mathrm{conclude}_2(\mathsf{a},\mathsf{t},\mathsf{c}) \overset{\mathrm{pyk}}{\to}$ “conclude two $*$ proves $*$ cache $*$ end conclude”]

$\mathrm{conclude}_3(*,*,*,*)$

$[\mathrm{conclude}_3(\mathsf{a},\mathsf{t},\mathsf{l},\mathsf{s}) \overset{\mathrm{val}}{\to} \mathsf{a}!\ [\ \mathsf{t}!\ [\ \mathsf{l}!\ [\ \mathsf{s}!$
$\mathrm{If}(\mathsf{l} \overset{\mathrm{r}}{=} \lceil \mathsf{x} \vdash \mathsf{y} \rceil, \ [\ [$
$\mathsf{t}\ ]\ \overset{\mathrm{r}}{=} \lceil \mathsf{x} \rhd \mathsf{y} \rceil\ ]\ \begin{cases} \mathrm{conclude}_3(\mathsf{a}^{\rhd}, \mathsf{t}^1, \mathsf{l}^2, \mathrm{unify}(\mathsf{l}^1 = \mathsf{t}^2, \mathsf{s})) \\ \mathrm{conclude}_3(\mathsf{a}^{\rhd}, \mathsf{t}, \mathsf{l}^2, \mathsf{s}) \end{cases},$
$\mathrm{If}(\mathsf{l} \overset{\mathrm{r}}{=} \lceil \mathsf{x} \Vdash \mathsf{y} \rceil, \ [\ [$
$\mathsf{t}\ ]\ \overset{\mathrm{r}}{=} \lceil \mathsf{x} \Rrightarrow \mathsf{y} \rceil\ ]\ \begin{cases} \mathrm{conclude}_3(\mathsf{a}^{\rhd}, \mathsf{t}^1, \mathsf{l}^2, \mathrm{unify}(\mathsf{l}^1 = \mathsf{t}^2, \mathsf{s})) \\ \mathrm{conclude}_3(\mathsf{a}^{\mathrm{V}}, \mathsf{t}, \mathsf{l}^2, \mathsf{s}) \end{cases},$
$\mathrm{If}(\mathsf{l} \overset{\mathrm{r}}{=} \lceil \forall \mathsf{x}\colon \mathsf{y} \rceil, \ [\ [$
$\mathsf{t}\ ]\ \overset{\mathrm{r}}{=} \lceil \mathsf{x} @ \mathsf{y} \rceil\ ]\ \begin{cases} \mathrm{conclude}_3(\mathsf{a} @ \ [\ \mathsf{t}^2\ ]\ , \mathsf{t}^1, \mathsf{l}^2, \mathrm{unify}(\mathsf{l}^1 = \mathsf{t}^2, \mathsf{s})) \\ \mathrm{conclude}_3(\mathsf{a} @ \ [\ \mathsf{l}^1\ ]\ , \mathsf{t}, \mathsf{l}^2, \mathsf{s}) \end{cases},$

$\mathrm{let}_1(\lambda \mathsf{s}.$
$\mathrm{If}(\mathsf{s}^{\mathsf{c}}, \mathsf{s},$
$\mathrm{inst}(\mathsf{a}, \mathsf{s})), \mathrm{unify}(\mathsf{l} = \mathsf{t}, \mathsf{s}))))) \;] \;] \;] \;]$

$[\mathrm{conclude}_3(\mathsf{a}, \mathsf{t}, \mathsf{l}, \mathsf{s}) \overset{\mathrm{tex}}{\rightarrow}$ “
conclude_3 (#1.
, #2.
, #3.
, #4.
)”]

$[\mathrm{conclude}_3(\mathsf{a}, \mathsf{t}, \mathsf{l}, \mathsf{s}) \overset{\mathrm{pyk}}{\rightarrow}$ “conclude three $*$ proves $*$ lemma $*$ substitution $*$ end conclude”]

$*\_\{*\}$

$[*\_\{*\} \overset{\mathrm{name}}{\rightarrow}$ “#1.
_\{#2.
\}”]

$[*\_\{*\} \overset{\mathrm{tex}}{\rightarrow}$ “#1.
_{#2.
}”]

$[*\_\{*\} \overset{\mathrm{pyk}}{\rightarrow}$ “$*$ sub $*$ end sub”]

$*'$

$[\mathsf{x}' \overset{\mathrm{tex}}{\rightarrow}$ “#1.’”]

$[\mathsf{x}' \overset{\mathrm{pyk}}{\rightarrow}$ “$*$ prime”]

$*\big[\ *\ \big]$

$[\mathsf{a}[\mathsf{k}] \overset{\mathrm{val}}{\rightarrow} \mathbf{assoc}_1(\mathsf{a}, \mathsf{k}, \mathsf{k})]$

$[*[\ *\ ] \overset{\mathrm{tex}}{\rightarrow}$ “#1.
{[}#2.
{]}”]

$[*[\ *\ ] \overset{\mathrm{pyk}}{\rightarrow}$ “$*$ assoc $*$ end assoc”]

$*\left[*\longrightarrow*\right]$

$$[\mathsf{a}[\mathsf{i}\to\mathsf{v}] \overset{\text{val}}{\to} \mathsf{i}^{\mathrm{c}} \left\{ \begin{array}{l} \mathsf{v} \left\{ \begin{array}{l} \text{array-remove}(\mathsf{i},\mathsf{a},0) \\ \text{array-put}(\mathsf{i},\mathsf{v},\mathsf{a},0) \end{array} \right. \\ \mathsf{v}!\mathsf{a} \end{array} \right.]$$

$[\mathsf{a}[\mathsf{i}\to\mathsf{v}] \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{[\#2.}$
$\text{\{\textbackslash rightarrow\} \#3.}$
$\text{]”}]$

$[\mathsf{a}[\mathsf{i}\to\mathsf{v}] \overset{\text{pyk}}{\to} \text{“}* \text{ set } * \text{ to } * \text{ end set”}]$

$*\left[*\Rightarrow*\right]$

$$[\mathsf{a}[\mathsf{i}\Rightarrow\mathsf{v}] \overset{\text{val}}{\to} \mathsf{i}^{\mathrm{a}} \left\{ \begin{array}{l} \mathsf{a}!\mathsf{v} \\ \mathsf{a}[\mathsf{i}^{\mathrm{h}}\to\mathsf{a}[\mathsf{i}^{\mathrm{h}}][\mathsf{i}^{\mathrm{t}}\Rightarrow\mathsf{v}]] \end{array} \right.]$$

$[\mathsf{a}[\mathsf{i}\Rightarrow\mathsf{v}] \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{[\#2.}$
$\text{\{\textbackslash Rightarrow\} \#3.}$
$\text{]”}]$

$[\mathsf{a}[\mathsf{i}\Rightarrow\mathsf{v}] \overset{\text{pyk}}{\to} \text{“}* \text{ set multi } * \text{ to } * \text{ end set”}]$

newline $*$

$[\text{newline } \mathsf{x} \overset{\text{name}}{\to} \text{“}$
$\text{newline\textbackslash\ \#1.”}]$

$[\text{newline } \mathsf{x} \overset{\text{val}}{\to} \mathsf{x}^{\mathrm{M}}]$

$[\text{newline } \mathsf{x} \overset{\text{tex}}{\to} \text{“}$
$\text{\textbackslash newline \#1.”}]$

$[\text{newline } \mathsf{x} \overset{\text{pyk}}{\to} \text{“newline } *\text{”}]$

macro newline $*$

$[\text{macro newline } \mathsf{x} \overset{\text{name}}{\to} \text{“}$
$\text{macro\textbackslash\ newline\textbackslash\ \#1.”}]$

$[\text{macro newline } \mathsf{x} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\text{macro newline } \mathsf{x} \doteqdot \mathsf{x}]\rceil)]$

[macro newline $\mathsf{x} \overset{\text{tex}}{\to}$ “
\newline #1.”]

[macro newline $\mathsf{x} \overset{\text{pyk}}{\to}$ “macro newline $*$”]

$*0$

[$\mathsf{x0} \overset{\text{val}}{\to} \mathsf{T}\ {+}2{*}\ \mathsf{x}$]

[$*0 \overset{\text{tex}}{\to}$ “#1.
0”]

[$*0 \overset{\text{pyk}}{\to}$ “$*$ bit nil”]

$*1$

[$\mathsf{x1} \overset{\text{val}}{\to} \mathsf{F}\ {+}2{*}\ \mathsf{x}$]

[$*1 \overset{\text{tex}}{\to}$ “#1.
1”]

[$*1 \overset{\text{pyk}}{\to}$ “$*$ bit one”]

0b

[$0\mathsf{b} \overset{\text{val}}{\to} 0$]

[$0\mathsf{b} \overset{\text{tex}}{\to}$ “
0 \mathrm {b}”]

[$0\mathsf{b} \overset{\text{pyk}}{\to}$ “binary”]

$*$-color$(*)$

$$[\mathsf{a\text{-}color(t)} \overset{\text{val}}{\to} \mathsf{t}^{\mathsf{d}} \begin{cases} [\,\mathsf{t}^{\mathsf{r}} :: [\,\mathsf{t}^{\mathsf{i}} :: [\,\mathsf{a}^{\mathsf{d}}\,]\,]\,] :: [\,\mathsf{a\text{-}color}^{*}(\mathsf{t}^{\mathsf{t}})\,] \\ \mathsf{a!t} \end{cases}]$$

[$\mathsf{x\text{-}color(y)} \overset{\text{tex}}{\to}$ “#1.
\mbox {-color}(#2.
)”]

[$\mathsf{x\text{-}color(y)} \overset{\text{pyk}}{\to}$ “$*$ color $*$ end color”]

$*$-color$^*(*)$

$[\mathsf{a\text{-}color}^*(\mathsf{t}) \stackrel{\text{val}}{\to} \mathsf{t} \begin{cases} \mathsf{a!T} \\ \mathsf{a\text{-}color}(\mathsf{t}^{\text{h}}) :: [\ \mathsf{a\text{-}color}^*(\mathsf{t}^{\text{t}})\ ] \end{cases}]$

$[\mathsf{x\text{-}color}^*(\mathsf{y}) \stackrel{\text{tex}}{\to}$ "#1.
\mbox {-color}^{\ast}(#2.
)"]

$[\mathsf{x\text{-}color}^*(\mathsf{y}) \stackrel{\text{pyk}}{\to}$ "$*$ color star $*$ end color"]

$*$ ' $*$

Predef: apply

$[* \text{'} * \stackrel{\text{tex}}{\to}$ "#1.
\mathbin {\mbox {'}}#2."]

$[* \text{'} * \stackrel{\text{pyk}}{\to}$ "$*$ apply $*$"]

$*$ ' $*$

$[\mathsf{f} \text{ ` } \mathsf{x} \stackrel{\text{val}}{\to} \mathbf{apply}(\mathsf{f}, \mathsf{x})]$

$[* \text{ ` } * \stackrel{\text{tex}}{\to}$ "#1.
\mathbin {\mbox {`}}#2."]

$[* \text{ ` } * \stackrel{\text{pyk}}{\to}$ "$*$ tagged apply $*$"]

$*^{\text{H}}$

$[\mathsf{x}^{\text{H}} \stackrel{\text{val}}{\to} \mathsf{x} \text{ ' } \mathsf{T}]$

$[*^{\text{H}} \stackrel{\text{tex}}{\to}$ "#1.
{}^H"]

$[*^{\text{H}} \stackrel{\text{pyk}}{\to}$ "$*$ raw head"]

$*^{\text{T}}$

$[\mathsf{x}^{\text{T}} \stackrel{\text{val}}{\to} \mathsf{x} \text{ ' } \mathsf{F}]$

$[*^{\text{T}} \stackrel{\text{tex}}{\to}$ "#1.
{}^T"]

$[*^{\mathrm{T}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ raw tail”}]$

$*^{\mathrm{U}}$

$[\mathsf{x}^{\mathrm{U}} \overset{\mathrm{val}}{\to} \mathrm{if}(\mathsf{x}^{\mathrm{H}}, \mathsf{x}^{\mathrm{T}}, \mathsf{T})]$

$[*^{\mathrm{U}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\mathrm{U}\text{”}]$

$[*^{\mathrm{U}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ cardinal untag”}]$

$*^{\mathrm{h}}$

$[\mathsf{x}^{\mathrm{h}} \overset{\mathrm{val}}{\Rightarrow} \mathsf{x}^{\mathrm{MTH}}]$

$[*^{\mathrm{h}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\mathrm{h}\text{”}]$

$[*^{\mathrm{h}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ head”}]$

$*^{\mathrm{t}}$

$[\mathsf{x}^{\mathrm{t}} \overset{\mathrm{val}}{\Rightarrow} \mathrm{if}(\mathsf{x}^{\mathrm{d}}, \mathrm{if}(\mathsf{x}^{\mathrm{c}}, \mathsf{T} \mathbin{\underline{\therefore}} [\, \mathsf{x}^{\mathrm{MTT}} \,], \mathsf{x}^{\mathrm{MTT}}), \mathsf{T})]$

$[*^{\mathrm{t}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\mathrm{t}\text{”}]$

$[*^{\mathrm{t}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ tail”}]$

$*^{\mathrm{s}}$

$[\mathsf{x}^{\mathrm{s}} \overset{\mathrm{val}}{\Rightarrow} \mathsf{x}^{\mathrm{MTB}}]$

$[*^{\mathrm{s}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\mathrm{s}\text{”}]$

$[*^{\mathrm{s}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ is singular”}]$

$*^{\mathrm{c}}$

$[\mathsf{x}^{\mathrm{c}} \overset{\mathrm{val}}{\Rightarrow} \mathrm{if}(\mathsf{x}, \mathsf{F}, \mathsf{x}^{\mathrm{MHB}})]$

$[*^{c} \overset{tex}{\rightarrow} \text{“\#1.}$
$\{\}\hat{}c\text{”}]$

$[*^{c} \overset{pyk}{\rightarrow} \text{“}* \text{ is cardinal”}]$

$*^{d}$

$[x^{d} \overset{val}{\Rightarrow} x^{MHTHB}]$

$[*^{d} \overset{tex}{\rightarrow} \text{“\#1.}$
$\{\}\hat{}d\text{”}]$

$[*^{d} \overset{pyk}{\rightarrow} \text{“}* \text{ is data”}]$

$*^{a}$

$[x^{a} \overset{val}{\rightarrow} [\ [\ \neg\ [\ x^{d}\ ]\ ]\ \vee\ [\ x^{c}\ ]\ ]\ \vee\ [\ x^{s}\ ]\ ]$

$[*^{a} \overset{tex}{\rightarrow} \text{“\#1.}$
$\{\}\hat{}a\text{”}]$

$[*^{a} \overset{pyk}{\rightarrow} \text{“}* \text{ is atomic”}]$

$*^{C}$

$[x^{C} \overset{val}{\rightarrow} \mathrm{if}(x, \mathsf{T}, x^{HB} \underline{+2*}\ [\ x^{TC}\ ]\ )]$

$[*^{C} \overset{tex}{\rightarrow} \text{“\#1.}$
$\{\}\hat{}C\text{”}]$

$[*^{C} \overset{pyk}{\rightarrow} \text{“}* \text{ cardinal retract”}]$

$*^{M}$

$[x^{M} \overset{val}{\Rightarrow} \mathrm{if}(x, \mathsf{T}, \mathrm{if}(x^{H}, \mathsf{T} \underline{\therefore}\ [\ x^{TC}\ ]\ , \mathrm{if}(x^{HTH}, x^{THM} \underline{::}\ [\ x^{TTM}\ ]\ , \mathcal{M}(x^{T}))))]$

$[*^{M} \overset{tex}{\rightarrow} \text{“\#1.}$
$\{\}\hat{}M\text{”}]$

$[*^{M} \overset{pyk}{\rightarrow} \text{“}* \text{ tagged retract”}]$

$*^{\mathrm{B}}$

$[\mathsf{x}^{\mathrm{B}} \overset{\mathrm{val}}{\to} \mathrm{if}(\mathsf{x}, \mathsf{T}, \mathsf{F})]$

$[*^{\mathrm{B}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\mathrm{B}\text{”}]$

$[*^{\mathrm{B}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ boolean retract”}]$

$*^{\mathrm{r}}$

$[\mathsf{x}^{\mathrm{r}} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{hh}}]$

$[\mathsf{x}^{\mathrm{r}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\{\mathrm{r}\}\text{”}]$

$[\mathsf{x}^{\mathrm{r}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ ref”}]$

$*^{\mathrm{i}}$

$[\mathsf{x}^{\mathrm{i}} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{hth}}]$

$[\mathsf{x}^{\mathrm{i}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\{\mathrm{i}\}\text{”}]$

$[\mathsf{x}^{\mathrm{i}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ id”}]$

$*^{\mathrm{d}}$

$[\mathsf{x}^{\mathrm{d}} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{htt}}]$

$[\mathsf{x}^{\mathrm{d}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\{\mathrm{d}\}\text{”}]$

$[\mathsf{x}^{\mathrm{d}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ debug”}]$

$*^{\mathrm{R}}$

$[\mathsf{x}^{\mathrm{R}} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{r}} :: [\, \mathsf{x}^{\mathrm{i}} :: \mathsf{T} \,]\,]$

$[\mathsf{x}^{\mathrm{R}} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\{\}\hat{}\{\mathrm{R}\}\text{”}]$

$[\mathsf{x}^{\mathrm{R}} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ root”}]$

$*^{0}$

$[x^{0} \overset{\text{val}}{\to} x^{\text{h}}]$

$[x^{0} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{0\}”}]$

$[x^{0} \overset{\text{pyk}}{\to} \text{“}* \text{ zeroth”}]$

$*^{1}$

$[x^{1} \overset{\text{val}}{\to} x^{\text{t}0}]$

$[x^{1} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{1\}”}]$

$[x^{1} \overset{\text{pyk}}{\to} \text{“}* \text{ first”}]$

$*^{2}$

$[x^{2} \overset{\text{val}}{\to} x^{\text{t}1}]$

$[x^{2} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{2\}”}]$

$[x^{2} \overset{\text{pyk}}{\to} \text{“}* \text{ second”}]$

$*^{3}$

$[x^{3} \overset{\text{val}}{\to} x^{\text{t}2}]$

$[x^{3} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{3\}”}]$

$[x^{3} \overset{\text{pyk}}{\to} \text{“}* \text{ third”}]$

$*^{4}$

$[x^{4} \overset{\text{val}}{\to} x^{\text{t}3}]$

$[x^{4} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{4\}”}]$

$[x^{4} \overset{\text{pyk}}{\to} \text{“}* \text{ fourth”}]$

$*^{5}$

$[x^{5} \overset{\text{val}}{\to} x^{t4}]$

$[x^{5} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{5\}”}]$

$[x^{5} \overset{\text{pyk}}{\to} \text{“}* \text{ fifth”}]$

$*^{6}$

$[x^{6} \overset{\text{val}}{\to} x^{t5}]$

$[x^{6} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{6\}”}]$

$[x^{6} \overset{\text{pyk}}{\to} \text{“}* \text{ sixth”}]$

$*^{7}$

$[x^{7} \overset{\text{val}}{\to} x^{t6}]$

$[x^{7} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{7\}”}]$

$[x^{7} \overset{\text{pyk}}{\to} \text{“}* \text{ seventh”}]$

$*^{8}$

$[x^{8} \overset{\text{val}}{\to} x^{t7}]$

$[x^{8} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{8\}”}]$

$[x^{8} \overset{\text{pyk}}{\to} \text{“}* \text{ eighth”}]$

$*^{9}$

$[x^{9} \overset{\text{val}}{\to} x^{t8}]$

$[x^{9} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\{\}\^{}\{9\}”}]$

$[x^{9} \overset{\text{pyk}}{\to} \text{“}* \text{ ninth”}]$

$*^{\mathrm{E}}$

$[\mathsf{x}^{\mathrm{E}} \overset{\mathrm{val}}{\to} \mathsf{x} \overset{\mathrm{r}}{=} \lceil \mathsf{xy} \rceil]$

$[\mathsf{x}^{\mathrm{E}} \overset{\mathrm{tex}}{\to}$ "#1.
{} ^ { E }"]

$[\mathsf{x}^{\mathrm{E}} \overset{\mathrm{pyk}}{\to}$ "$*$ is error"]

$*^{\mathcal{V}}$

$[\mathsf{t}^{\mathcal{V}} \overset{\mathrm{val}}{\to} \mathsf{t} \overset{\mathrm{r}}{=} \lceil \underline{\mathsf{a}} \rceil]$

$[\mathsf{t}^{\mathcal{V}} \overset{\mathrm{tex}}{\to}$ "#1.
{} ^ {\cal V}"]

$[\mathsf{t}^{\mathcal{V}} \overset{\mathrm{pyk}}{\to}$ "$*$ is metavar"]

$*^{\mathcal{C}}$

$[\mathsf{t}^{\mathcal{C}} \overset{\mathrm{val}}{\to} \mathrm{If}(\mathsf{t}^{\mathcal{V}}, \mathsf{F}, \mathsf{t}^{\mathrm{t}\mathcal{C}^*})]$

$[\mathsf{t}^{\mathcal{C}} \overset{\mathrm{tex}}{\to}$ "#1.
{} ^ {\cal C}"]

$[\mathsf{t}^{\mathcal{C}} \overset{\mathrm{pyk}}{\to}$ "$*$ is metaclosed"]

$*^{\mathcal{C}^*}$

$[\mathsf{t}^{\mathcal{C}^*} \overset{\mathrm{val}}{\to} \mathrm{If}(\mathsf{t}, \mathsf{T}, \mathrm{If}(\mathsf{t}^{\mathrm{h}\mathcal{C}}, \mathsf{t}^{\mathrm{t}\mathcal{C}^*}, \mathsf{F}))]$

$[\mathsf{t}^{\mathcal{C}^*} \overset{\mathrm{tex}}{\to}$ "#1.
{} ^ {{\cal C} ^ { \ast }}"]

$[\mathsf{t}^{\mathcal{C}^*} \overset{\mathrm{pyk}}{\to}$ "$*$ is metaclosed star"]

$* \cdot *$

$[\mathsf{x} \cdot \mathsf{y} \overset{\mathrm{val}}{\to} \mathrm{If}(\mathsf{x}^{\mathrm{c}} \wedge [\ \mathsf{y}^{\mathrm{c}}\ ], \mathsf{x} \cdot_0 \mathsf{y}, \mathsf{T})]$

$[\mathsf{x} \cdot \mathsf{y} \overset{\mathrm{tex}}{\to}$ "#1.
\cdot #2."]

$[\mathsf{x} \cdot \mathsf{y} \overset{\mathrm{pyk}}{\to}$ "$*$ times $*$"]

$* \cdot_0 *$

$$[\mathsf{x} \cdot_0 \mathsf{y} \overset{\mathrm{val}}{\to} \mathsf{y}^{\mathrm{s}} \left\{ \begin{array}{l} \mathsf{x}!0 \\ \mathsf{y}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{T} +2* \ [\ \mathsf{x} \cdot_0 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \\ (\mathsf{T} +2* \ [\ \mathsf{x} \cdot_0 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ])^{\mathrm{M}} +_0 \mathsf{x} \end{array} \right. \end{array} \right.]$$

$[\mathsf{x} \cdot_0 \mathsf{y} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\backslash\mathrm{cdot\_0}\ \#2.\text{”}]$

$[\mathsf{x} \cdot_0 \mathsf{y} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ times zero } *\text{”}]$

$* + *$

$[\mathsf{x} + \mathsf{y} \overset{\mathrm{val}}{\to} \mathrm{If}(\mathsf{x}^{\mathrm{c}} \wedge \ [\ \mathsf{y}^{\mathrm{c}} \ ]\ , \mathsf{x} +_0 \mathsf{y}, \mathsf{T})]$

$[\mathsf{x} + \mathsf{y} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$+\ \#2.\text{”}]$

$[\mathsf{x} + \mathsf{y} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ plus } *\text{”}]$

$* +_0 *$

$$[\mathsf{x} +_0 \mathsf{y} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{s}} \left\{ \begin{array}{l} \mathsf{y} \\ \mathsf{y}^{\mathrm{s}} \left\{ \begin{array}{l} \mathsf{x} \\ \mathsf{x}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{y}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{T} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_0 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \\ \mathsf{F} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_0 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \end{array} \right. \\ \mathsf{y}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{F} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_0 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \\ \mathsf{T} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_1 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \end{array} \right. \end{array} \right. \end{array} \right. \end{array} \right.]$$

$[\mathsf{x} +_0 \mathsf{y} \overset{\mathrm{tex}}{\to} \text{“\#1.}$
$\backslash\mathrm{mathop\{+\_0\}}\ \#2.\text{”}]$

$[\mathsf{x} +_0 \mathsf{y} \overset{\mathrm{pyk}}{\to} \text{“}* \text{ plus zero } *\text{”}]$

$* +_1 *$

$$[\mathsf{x} +_1 \mathsf{y} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{s}} \left\{ \begin{array}{l} \mathsf{y} +_0 1 \\ \mathsf{y}^{\mathrm{s}} \left\{ \begin{array}{l} \mathsf{x} +_0 1 \\ \mathsf{x}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{y}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{F} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_0 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \\ \mathsf{T} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_1 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \end{array} \right. \\ \mathsf{y}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{T} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_1 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \\ \mathsf{F} +2* \ [\ \mathsf{x}^{\mathrm{t}} +_1 \ [\ \mathsf{y}^{\mathrm{t}} \ ]\ ] \end{array} \right. \end{array} \right. \end{array} \right. \end{array} \right.]$$

$[\mathsf{x} +_1 \mathsf{y} \overset{\mathrm{tex}}{\to} \text{“\#1.}$

\mathop{+_1} #2."]

$[\mathsf{x} +_1 \mathsf{y} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ plus one } *\text{”}]$

$* - *$

$[\mathsf{x} - \mathsf{y} \overset{\text{val}}{\rightarrow} \mathrm{If}(\mathsf{x}^{\mathsf{c}} \wedge [\,\mathsf{y}^{\mathsf{c}}\,], \mathrm{If}(\mathsf{x} < \mathsf{y}, 0, \mathsf{x} -_0 \mathsf{y}), \mathsf{T})]$

$[\mathsf{x} - \mathsf{y} \overset{\text{tex}}{\rightarrow} \text{“}\#1.$
$- \#2.\text{”}]$

$[\mathsf{x} - \mathsf{y} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ minus } *\text{”}]$

$* -_0 *$

$$[\mathsf{x} -_0 \mathsf{y} \overset{\text{val}}{\rightarrow} \mathsf{y}^{\mathsf{s}} \begin{cases} \mathsf{x} \\ \mathsf{x}^{\mathsf{h}} \begin{cases} \mathsf{y}^{\mathsf{h}} \begin{cases} \mathsf{T} +2* [\,\mathsf{x}^{\mathsf{t}} -_0 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \\ \mathsf{F} +2* [\,\mathsf{x}^{\mathsf{t}} -_1 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \end{cases} \\ \mathsf{y}^{\mathsf{h}} \begin{cases} \mathsf{F} +2* [\,\mathsf{x}^{\mathsf{t}} -_0 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \\ \mathsf{T} +2* [\,\mathsf{x}^{\mathsf{t}} -_0 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \end{cases} \end{cases} \end{cases}]$$

$[\mathsf{x} -_0 \mathsf{y} \overset{\text{tex}}{\rightarrow} \text{“}\#1.$
$\mathop{-_0} \#2.\text{”}]$

$[\mathsf{x} -_0 \mathsf{y} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ minus zero } *\text{”}]$

$* -_1 *$

$$[\mathsf{x} -_1 \mathsf{y} \overset{\text{val}}{\rightarrow} \mathsf{y}^{\mathsf{s}} \begin{cases} \mathsf{x} -_0 1 \\ \mathsf{x}^{\mathsf{h}} \begin{cases} \mathsf{y}^{\mathsf{h}} \begin{cases} \mathsf{F} +2* [\,\mathsf{x}^{\mathsf{t}} -_1 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \\ \mathsf{T} +2* [\,\mathsf{x}^{\mathsf{t}} -_1 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \end{cases} \\ \mathsf{y}^{\mathsf{h}} \begin{cases} \mathsf{T} +2* [\,\mathsf{x}^{\mathsf{t}} -_0 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \\ \mathsf{F} +2* [\,\mathsf{x}^{\mathsf{t}} -_1 [\,\mathsf{y}^{\mathsf{t}}\,]\,] \end{cases} \end{cases} \end{cases}]$$

$[\mathsf{x} -_1 \mathsf{y} \overset{\text{tex}}{\rightarrow} \text{“}\#1.$
$\mathop{-_1} \#2.\text{”}]$

$[\mathsf{x} -_1 \mathsf{y} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ minus one } *\text{”}]$

$* \cup \{*\}$

$[\mathsf{x} \cup \{\mathsf{y}\} \overset{\text{val}}{\rightarrow} \mathrm{If}(\mathsf{y} \in_{\mathsf{t}} \mathsf{x}, \mathsf{x}, \mathsf{y} :: \mathsf{x})]$

$[\mathsf{x} \cup \{\mathsf{y}\} \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{cup } \backslash\{ \text{ \#2.}$
$\backslash\}\text{”}]$

$[\mathsf{x} \cup \{\mathsf{y}\} \overset{\text{pyk}}{\to} \text{“}* \text{ term plus } * \text{ end plus”}]$

$* \bigcup *$

$[\mathsf{x} \cup \mathsf{y} \overset{\text{val}}{\to} \text{If}(\mathsf{x}^{\mathsf{a}}, \mathsf{y}, \ [\ \mathsf{x}^{\mathsf{t}} \cup \mathsf{y}\ ]\ \cup \{\mathsf{x}^{\mathsf{h}}\})]$

$[\mathsf{x} \cup \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{cup \#2.”}]$

$[\mathsf{x} \cup \mathsf{y} \overset{\text{pyk}}{\to} \text{“}* \text{ term union } *\text{”}]$

$*\backslash\{*\}$

$[\mathsf{x}\backslash\{\mathsf{y}\} \overset{\text{val}}{\to} \text{If}(\mathsf{x}^{\mathsf{a}}, \mathsf{y}!\emptyset, \text{If}(\mathsf{y} \overset{\text{t}}{=} \ [\ \mathsf{x}^{\mathsf{h}}\ ]\ , \mathsf{x}^{\mathsf{t}}, \mathsf{x}^{\mathsf{h}} :: \ [\ \mathsf{x}^{\mathsf{t}}\backslash\{\mathsf{y}\}\ ]\ ))]$

$[\mathsf{x}\backslash\{\mathsf{y}\} \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{backslash } \backslash\{ \text{ \#2.}$
$\backslash\}\text{”}]$

$[\mathsf{x}\backslash\{\mathsf{y}\} \overset{\text{pyk}}{\to} \text{“}* \text{ term minus } * \text{ end minus”}]$

$* \mathbin{\dot{\therefore}} *$

$[\mathsf{y} \mathbin{\dot{\therefore}} \mathsf{z} \overset{\text{val}}{\Rightarrow} \lambda\mathsf{x}.\text{if}(\mathsf{x}, \mathsf{y}, \mathsf{z})]$

$[* \mathbin{\dot{\therefore}} * \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{mathrel } \{ \backslash\text{dot } \{ \ . \ \backslash, \ . \ \} \}\#2.\text{”}]$

$[* \mathbin{\dot{\therefore}} * \overset{\text{pyk}}{\to} \text{“}* \text{ raw pair } *\text{”}]$

$* \mathbin{\underline{\dot{\therefore}}} *$

$[\mathsf{x} \mathbin{\underline{\dot{\therefore}}} \mathsf{y} \overset{\text{val}}{\to} \mathsf{x} : \ [\ \mathsf{y} : \ [\ \mathsf{x} \mathbin{\dot{\therefore}} \mathsf{y}\ ]\ ]\ ]$

$[* \mathbin{\underline{\dot{\therefore}}} * \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{mathrel } \{ \backslash\text{underline } \{ \backslash\text{dot } \{ \ . \ \backslash, \ . \ \} \ \} \}\#2.\text{”}]$

$[* \mathbin{\underline{\dot{\therefore}}} * \overset{\text{pyk}}{\to} \text{“}* \text{ eager pair } *\text{”}]$

$* \underline{::} *$

$[x \underline{::} y \overset{\text{val}}{\to} (\underline{0} \underline{\therefore} \ [\ \underline{0} \underline{\therefore} \mathsf{T}\ ]\ )^{\mathrm{I}} \underline{\therefore} \ [\ x \underline{\therefore} y\ ]\ ]$

$[* \underline{::} * \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\mathrel \{ \underline \{ : \backslash, : \} \}\#2.”}]$

$[* \underline{::} * \overset{\text{pyk}}{\to} \text{“}* \text{ tagged pair } *\text{”}]$

$* \underline{+2*} *$

$[x \underline{+2*} y \overset{\text{val}}{\to} \mathrm{if}(x, \mathrm{if}(y, \mathsf{T}, x \underline{\therefore} y), x \underline{\therefore} y)]$

$[* \underline{+2*} * \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\mathrel \{ \underline \{ \{+\} 2 \backslash ast \} \}\#2.”}]$

$[* \underline{+2*} * \overset{\text{pyk}}{\to} \text{“}* \text{ untagged double } *\text{”}]$

$* : : *$

$[x : : y \overset{\text{val}}{\Rightarrow} x^{\mathrm{M}} \underline{::} \ [\ y^{\mathrm{M}}\ ]\ ]$

$[x : : y \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\mathrel \{ : \backslash, : \}\#2.”}]$

$[* : : * \overset{\text{pyk}}{\to} \text{“}* \text{ pair } *\text{”}]$

$* +2* *$

$[x +2* y \overset{\text{val}}{\Rightarrow} \mathsf{T} \underline{\therefore} \ [\ x^{\mathrm{B}} \underline{\therefore} \ [\ y^{\mathrm{UC}}\ ]\ ]\ ]$

$[* +2* * \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\mathrel \{ \{+\} 2 \backslash ast \}\#2.”}]$

$[* +2* * \overset{\text{pyk}}{\to} \text{“}* \text{ double } *\text{”}]$

$*, *$

$[x, y \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{, \backslash linebreak [0] \#2.”}]$

$[x, y \overset{\text{pyk}}{\to} \text{“}* \text{ comma } *\text{”}]$

$$* \overset{\mathrm{B}}{\approx} *$$

$$[\mathsf{x} \overset{\mathrm{B}}{\approx} \mathsf{y} \overset{\mathrm{val}}{\to} \mathsf{x} \begin{cases} \mathrm{If}(\mathsf{y}, \mathsf{T}, \mathsf{F}) \\ \mathrm{If}(\mathsf{y}, \mathsf{F}, \mathsf{T}) \end{cases}]$$

$$[* \overset{\mathrm{B}}{\approx} * \overset{\mathrm{tex}}{\to} \text{“\#1.}$$
$$\backslash\mathrm{stackrel}\ \{\mathrm{B}\}\{\backslash\mathrm{approx}\ \}\#2.\text{”}]$$

$$[* \overset{\mathrm{B}}{\approx} * \overset{\mathrm{pyk}}{\to} \text{“}* \text{ boolean equal } *\text{”}]$$

$$* \overset{\mathrm{D}}{\approx} *$$

$$[\mathsf{x} \overset{\mathrm{D}}{\approx} \mathsf{y} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{c}} \begin{cases} \mathrm{If}(\mathsf{y}^{\mathrm{c}}, \mathsf{x} \overset{\mathrm{C}}{\approx} \mathsf{y}, \mathsf{F}) \\ \mathrm{If}(\mathsf{y}^{\mathrm{c}}, \mathsf{F}, \mathsf{x} \overset{\mathrm{P}}{\approx} \mathsf{y}) \end{cases}]$$

$$[* \overset{\mathrm{D}}{\approx} * \overset{\mathrm{tex}}{\to} \text{“\#1.}$$
$$\backslash\mathrm{stackrel}\ \{\mathrm{D}\}\{\backslash\mathrm{approx}\ \}\#2.\text{”}]$$

$$[* \overset{\mathrm{D}}{\approx} * \overset{\mathrm{pyk}}{\to} \text{“}* \text{ data equal } *\text{”}]$$

$$* \overset{\mathrm{C}}{\approx} *$$

$$[\mathsf{x} \overset{\mathrm{C}}{\approx} \mathsf{y} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{s}} \begin{cases} \mathrm{If}(\mathsf{y}^{\mathrm{s}}, \mathsf{T}, \mathsf{F}) \\ \mathrm{If}(\mathsf{y}^{\mathrm{s}}, \mathsf{F}, [\, \mathsf{x}^{\mathrm{h}} \overset{\mathrm{B}}{\approx} [\, \mathsf{y}^{\mathrm{h}} \,] \,] \wedge [\, \mathsf{x}^{\mathrm{t}} \overset{\mathrm{C}}{\approx} [\, \mathsf{y}^{\mathrm{t}} \,] \,]) \end{cases}]$$

$$[* \overset{\mathrm{C}}{\approx} * \overset{\mathrm{tex}}{\to} \text{“\#1.}$$
$$\backslash\mathrm{stackrel}\ \{\mathrm{C}\}\{\backslash\mathrm{approx}\ \}\#2.\text{”}]$$

$$[* \overset{\mathrm{C}}{\approx} * \overset{\mathrm{pyk}}{\to} \text{“}* \text{ cardinal equal } *\text{”}]$$

$$* \overset{\mathrm{P}}{\approx} *$$

$$[\mathsf{x} \overset{\mathrm{P}}{\approx} \mathsf{y} \overset{\mathrm{val}}{\to} \mathsf{x}^{\mathrm{s}} \begin{cases} \mathrm{If}(\mathsf{y}^{\mathrm{s}}, \mathsf{T}, \mathsf{F}) \\ \mathrm{If}(\mathsf{y}^{\mathrm{s}}, \mathsf{F}, [\, \mathsf{x}^{\mathrm{h}} \approx [\, \mathsf{y}^{\mathrm{h}} \,] \,] \wedge [\, \mathsf{x}^{\mathrm{t}} \approx [\, \mathsf{y}^{\mathrm{t}} \,] \,]) \end{cases}]$$

$$[* \overset{\mathrm{P}}{\approx} * \overset{\mathrm{tex}}{\to} \text{“\#1.}$$
$$\backslash\mathrm{stackrel}\ \{\mathrm{P}\}\{\backslash\mathrm{approx}\ \}\#2.\text{”}]$$

$$[* \overset{\mathrm{P}}{\approx} * \overset{\mathrm{pyk}}{\to} \text{“}* \text{ peano equal } *\text{”}]$$

$$* \approx *$$

$$[\mathsf{x} \approx \mathsf{y} \overset{\text{val}}{\Rightarrow} \mathsf{x}^{\mathrm{d}} \begin{cases} \mathrm{If}(\mathsf{y}^{\mathrm{d}}, \mathsf{x} \overset{\mathrm{D}}{\approx} \mathsf{y}, \mathsf{F}) \\ \mathrm{If}(\mathsf{y}^{\mathrm{d}}, \mathsf{F}, \mathsf{T}) \end{cases}]$$

$$[* \approx * \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\text{approx \#2.”}]$$

$$[* \approx * \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ tagged equal } *\text{”}]$$

$$* = *$$

$$[* = * \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$=\text{\#2.”}]$$

$$[* = * \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ math equal } *\text{”}]$$

$$* \overset{+}{\rightarrow} *$$

$$[* \overset{+}{\rightarrow} * \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\text{stackrel \{+\}\{\textbackslash rightarrow \}\#2.”}]$$

$$[* \overset{+}{\rightarrow} * \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ reduce to } *\text{”}]$$

$$* \overset{\mathrm{t}}{=} *$$

$$[\mathsf{x} \overset{\mathrm{t}}{=} \mathsf{y} \overset{\text{val}}{\rightarrow} \mathrm{If}(\mathsf{x} \overset{\mathrm{r}}{=} \mathsf{y}, \mathsf{x}^{\mathrm{t}} \overset{\mathrm{t}^*}{=} [\ \mathsf{y}^{\mathrm{t}}\ ], \mathsf{F})]$$

$$[* \overset{\mathrm{t}}{=} * \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\text{stackrel \{t\}\{=\}\#2.”}]$$

$$[* \overset{\mathrm{t}}{=} * \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ term equal } *\text{”}]$$

$$* \overset{\mathrm{t}^*}{=} *$$

$$[\mathsf{x} \overset{\mathrm{t}^*}{=} \mathsf{y} \overset{\text{val}}{\rightarrow} \mathsf{x}^{\mathrm{a}} \begin{cases} \mathrm{If}(\mathsf{y}^{\mathrm{a}}, \mathsf{T}, \mathsf{F}) \\ \mathrm{If}(\mathsf{y}^{\mathrm{a}}, \mathsf{F}, \mathrm{If}(\mathsf{x}^{\mathrm{h}} \overset{\mathrm{t}}{=} [\ \mathsf{y}^{\mathrm{h}}\ ], \mathsf{x}^{\mathrm{t}} \overset{\mathrm{t}^*}{=} [\ \mathsf{y}^{\mathrm{t}}\ ], \mathsf{F})) \end{cases}]$$

$$[* \overset{\mathrm{t}^*}{=} * \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\text{stackrel \{t\^{}*\}\{=\}\#2.”}]$$

$$[* \overset{\mathrm{t}^*}{=} * \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ term list equal } *\text{”}]$$

$$* \stackrel{\mathrm{r}}{=} *$$

$$[\mathsf{x} \stackrel{\mathrm{r}}{=} \mathsf{y} \stackrel{\mathrm{val}}{\rightarrow} \mathrm{If}(\mathsf{x}^{\mathrm{r}} \approx \ [\ \mathsf{y}^{\mathrm{r}}\ ]\ , \mathsf{x}^{\mathrm{i}} \approx \ [\ \mathsf{y}^{\mathrm{i}}\ ]\ , \mathsf{F})]$$

$$[\mathsf{x} \stackrel{\mathrm{r}}{=} \mathsf{y} \stackrel{\mathrm{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\mathrm{stackrel}\{\mathrm{r}\}\{=\}\ \#2.\text{”}]$$

$$[\mathsf{x} \stackrel{\mathrm{r}}{=} \mathsf{y} \stackrel{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ term root equal } *\text{”}]$$

$$* \in_{\mathrm{t}} *$$

$$[\mathsf{x} \in_{\mathrm{t}} \mathsf{y} \stackrel{\mathrm{val}}{\rightarrow} \mathrm{If}(\mathsf{y}^{\mathrm{a}}, \mathsf{x}!\mathsf{F}, \mathrm{If}(\mathsf{x} \stackrel{\mathrm{t}}{=} \ [\ \mathsf{y}^{\mathrm{h}}\ ]\ , \mathsf{T}, \mathsf{x} \in_{\mathrm{t}} \ [\ \mathsf{y}^{\mathrm{t}}\ ]\ ))]$$

$$[\mathsf{x} \in_{\mathrm{t}} \mathsf{y} \stackrel{\mathrm{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\mathrm{in\_t}\ \#2.\text{”}]$$

$$[\mathsf{x} \in_{\mathrm{t}} \mathsf{y} \stackrel{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ term in } *\text{”}]$$

$$* \subseteq_{\mathrm{T}} *$$

$$[\mathsf{x} \subseteq_{\mathrm{T}} \mathsf{y} \stackrel{\mathrm{val}}{\rightarrow} \mathrm{If}(\mathsf{x}^{\mathrm{a}}, \mathsf{y}!\mathsf{T}, \mathrm{If}(\mathsf{x}^{\mathrm{h}} \in_{\mathrm{t}} \mathsf{y}, \mathsf{x}^{\mathrm{t}} \subseteq_{\mathrm{T}} \mathsf{y}, \mathsf{F}))]$$

$$[\mathsf{x} \subseteq_{\mathrm{T}} \mathsf{y} \stackrel{\mathrm{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\mathrm{subseteq\_T}\ \#2.\text{”}]$$

$$[\mathsf{x} \subseteq_{\mathrm{T}} \mathsf{y} \stackrel{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ term subset } *\text{”}]$$

$$* \stackrel{\mathrm{T}}{=} *$$

$$[\mathsf{x} \stackrel{\mathrm{T}}{=} \mathsf{y} \stackrel{\mathrm{val}}{\rightarrow} \mathrm{If}(\mathsf{x} \subseteq_{\mathrm{T}} \mathsf{y}, \mathsf{y} \subseteq_{\mathrm{T}} \mathsf{x}, \mathsf{F})]$$

$$[\mathsf{x} \stackrel{\mathrm{T}}{=} \mathsf{y} \stackrel{\mathrm{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\mathrm{stackrel}\{\mathrm{T}\}\{=\}\ \#2.\text{”}]$$

$$[\mathsf{x} \stackrel{\mathrm{T}}{=} \mathsf{y} \stackrel{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ term set equal } *\text{”}]$$

$$* \stackrel{\mathrm{S}}{=} *$$

$$[\mathsf{x} \stackrel{\mathrm{s}}{=} \mathsf{y} \stackrel{\mathrm{val}}{\rightarrow} \mathrm{If}(\neg\ [\ \mathsf{x}^2 \stackrel{\mathrm{t}}{=} \ [\ \mathsf{y}^2\ ]\ ]\ , \mathsf{F}, \mathrm{If}(\mathsf{x}^0 \stackrel{\mathrm{T}}{=} \ [\ \mathsf{y}^0\ ]\ , \mathsf{x}^1 \stackrel{\mathrm{T}}{=} \ [\ \mathsf{y}^1\ ]\ , \mathsf{F}))]$$

$$[\mathsf{x} \stackrel{\mathrm{s}}{=} \mathsf{y} \stackrel{\mathrm{tex}}{\rightarrow} \text{“\#1.}$$
$$\backslash\mathrm{stackrel}\{\mathrm{s}\}\{=\}\ \#2.\text{”}]$$

$$[\mathsf{x} \stackrel{\mathrm{s}}{=} \mathsf{y} \stackrel{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ sequent equal } *\text{”}]$$

$*$ free in $*$

$[\mathsf{v}\ \text{free in}\ \mathsf{t} \overset{\text{val}}{\rightarrow}$
$\text{If}(\mathsf{v} \overset{\text{t}}{=} \mathsf{t}, \mathsf{T},$
$\text{If}(\neg\ [\ \mathsf{t} \overset{\text{r}}{=} \lceil \forall *\colon * \rceil\ ]\ , \mathsf{v}\ \text{free in}^{*}\ \ [\ \mathsf{t}^{\mathsf{t}}\ ]\ ,$
$\text{If}(\mathsf{v} \overset{\text{t}}{=}\ \ [\ \mathsf{t}^{1}\ ]\ , \mathsf{F}, \mathsf{v}\ \text{free in}\ \ [\ \mathsf{t}^{2}\ ]\ )))]$

$[\mathsf{x}\ \text{free in}\ \mathsf{y} \overset{\text{tex}}{\rightarrow}$ "#1.
\mathrel {free\ in} #2."]

$[\mathsf{v}\ \text{free in}\ \mathsf{t} \overset{\text{pyk}}{\rightarrow}$ "$*$ free in $*$"]

$*$ free in* $*$

$[\mathsf{v}\ \text{free in}^{*}\ \mathsf{t} \overset{\text{val}}{\rightarrow} \text{If}(\mathsf{t}, \mathsf{v}!\mathsf{F}, \text{If}(\mathsf{v}\ \text{free in}\ \ [\ \mathsf{t}^{\mathsf{h}}\ ]\ , \mathsf{T}, \mathsf{v}\ \text{free in}^{*}\ \ [\ \mathsf{t}^{\mathsf{t}}\ ]\ ))]$

$[\mathsf{x}\ \text{free in}^{*}\ \mathsf{y} \overset{\text{tex}}{\rightarrow}$ "#1.
\mathrel {free\ in}\^{}{\ast} #2."]

$[\mathsf{v}\ \text{free in}^{*}\ \mathsf{t} \overset{\text{pyk}}{\rightarrow}$ "$*$ free in star $*$"]

$*$ free for $*$ in $*$

$[\mathsf{a}\ \text{free for}\ \mathsf{x}\ \text{in}\ \mathsf{b} \overset{\text{val}}{\rightarrow} \mathsf{a}!\ [\ \mathsf{x}!$
$\text{If}(\mathsf{b}^{\mathcal{V}}, \mathsf{T},$
$\text{If}(\neg\ [\ \mathsf{b} \overset{\text{r}}{=} \lceil \forall *\colon * \rceil\ ]\ , \mathsf{a}\ \text{free for}^{*}\ \mathsf{x}\ \text{in}\ \ [\ \mathsf{b}^{\mathsf{t}}\ ]\ ,$
$\text{If}(\mathsf{x} \overset{\text{t}}{=}\ \ [\ \mathsf{b}^{1}\ ]\ , \mathsf{T},$
$\text{If}(\neg\ [\ \mathsf{x}\ \text{free in}\ \ [\ \mathsf{b}^{2}\ ]\ ]\ , \mathsf{T},$
$\text{If}(\mathsf{b}^{1}\ \text{free in}\ \mathsf{a}, \mathsf{F},\ [$
$\mathsf{a}\ ]\ \ \text{free for}\ \mathsf{x}\ \text{in}\ \ [\ \mathsf{b}^{2}\ ]\ ))))))\ ]\ ]$

$[\mathsf{a}\ \text{free for}\ \mathsf{x}\ \text{in}\ \mathsf{b} \overset{\text{tex}}{\rightarrow}$ "#1.
\mathrel {free\ for} #2.
\mathrel {in} #3."]

$[\mathsf{a}\ \text{free for}\ \mathsf{x}\ \text{in}\ \mathsf{b} \overset{\text{pyk}}{\rightarrow}$ "$*$ free for $*$ in $*$"]

$*$ free for* $*$ in $*$

$[\mathsf{a}\ \text{free for}^{*}\ \mathsf{x}\ \text{in}\ \mathsf{b} \overset{\text{val}}{\rightarrow}$
$\text{If}(\mathsf{b}, \mathsf{a}!\ [\ \mathsf{x}!\mathsf{T}\ ]\ ,$
$\text{If}(\mathsf{a}\ \text{free for}\ \mathsf{x}\ \text{in}\ \ [\ \mathsf{b}^{\mathsf{h}}\ ]\ , \mathsf{a}\ \text{free for}^{*}\ \mathsf{x}\ \text{in}\ \ [\ \mathsf{b}^{\mathsf{t}}\ ]\ , \mathsf{F}))]$

$[\mathsf{a}\ \text{free for}^*\ \mathsf{x}\ \text{in}\ \mathsf{b} \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{mathrel }\{\text{free}\backslash\ \text{for}\}\hat{}\{\backslash\text{ast}\}\ \#2.$
$\backslash\text{mathrel }\{\text{in}\}\ \#3.\text{”}]$

$[\mathsf{a}\ \text{free for}^*\ *\ \text{in}\ \mathsf{b} \overset{\text{pyk}}{\to} \text{“}*\ \text{free for star}\ *\ \text{in}\ *\text{”}]$

$* \in_c *$

$$[\mathsf{x} \in_c \mathsf{y} \overset{\text{val}}{\to} [\ \mathsf{y} \overset{\text{r}}{=} \lceil \mathsf{x} \wedge_c \mathsf{y} \rceil\ ] \begin{cases} \text{If}(\mathsf{x} \in_c [\ \mathsf{y}^1\ ], \mathsf{T}, \mathsf{x} \in_c [\ \mathsf{y}^2\ ]) \\ \mathsf{x} \overset{\text{t}}{=} \mathsf{y} \end{cases}]$$

$[\mathsf{x} \in_c \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{in\_c }\#2.\text{”}]$

$[\mathsf{x} \in_c \mathsf{y} \overset{\text{pyk}}{\to} \text{“}*\ \text{claim in}\ *\text{”}]$

$* < *$

$[\mathsf{x} < \mathsf{y} \overset{\text{val}}{\to} \text{If}(\mathsf{x}^{\mathsf{c}} \wedge [\ \mathsf{y}^{\mathsf{c}}\ ], \mathsf{x} <' \mathsf{y}, \mathsf{F})]$

$[\mathsf{x} < \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$< \#2.\text{”}]$

$[\mathsf{x} < \mathsf{y} \overset{\text{pyk}}{\to} \text{“}*\ \text{less}\ *\text{”}]$

$* <' *$

$$[\mathsf{x} <' \mathsf{y} \overset{\text{val}}{\to} \mathsf{y}^{\mathsf{s}} \begin{cases} \mathsf{x}!\mathsf{F} \\ \mathsf{x}^{\mathsf{s}} \begin{cases} \mathsf{T} \\ \mathsf{x}^{\mathsf{h}} \begin{cases} \mathsf{y}^{\mathsf{h}} \begin{cases} \mathsf{x}^{\mathsf{t}} <' [\ \mathsf{y}^{\mathsf{t}}\ ] \\ \mathsf{x}^{\mathsf{t}} \leq' [\ \mathsf{y}^{\mathsf{t}}\ ] \end{cases} \\ \mathsf{y}^{\mathsf{h}} \begin{cases} \mathsf{x}^{\mathsf{t}} <' [\ \mathsf{y}^{\mathsf{t}}\ ] \\ \mathsf{x}^{\mathsf{t}} <' [\ \mathsf{y}^{\mathsf{t}}\ ] \end{cases} \end{cases} \end{cases} \end{cases}]$$

$[\mathsf{x} <' \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$<' \#2.\text{”}]$

$[\mathsf{x} <' \mathsf{y} \overset{\text{pyk}}{\to} \text{“}*\ \text{less zero}\ *\text{”}]$

$$* \leq' *$$

$$[\mathsf{x} \leq' \mathsf{y} \overset{\text{val}}{\to} \mathsf{x}^{\mathrm{s}} \left\{ \begin{array}{l} \mathsf{y!T} \\ \mathsf{y}^{\mathrm{s}} \left\{ \begin{array}{l} \mathsf{F} \\ \mathsf{x}^{\mathrm{h}} \left\{ \begin{array}{l} \mathsf{y}^{\mathrm{h}} \left\{ \begin{array}{ll} \mathsf{x}^{\mathrm{t}} \leq' & [\,\mathsf{y}^{\mathrm{t}}\,] \\ \mathsf{x}^{\mathrm{t}} \leq' & [\,\mathsf{y}^{\mathrm{t}}\,] \end{array} \right. \\ \mathsf{y}^{\mathrm{h}} \left\{ \begin{array}{ll} \mathsf{x}^{\mathrm{t}} <' & [\,\mathsf{y}^{\mathrm{t}}\,] \\ \mathsf{x}^{\mathrm{t}} \leq' & [\,\mathsf{y}^{\mathrm{t}}\,] \end{array} \right. \end{array} \right. \end{array} \right. \end{array} \right.]$$

$[\mathsf{x} \leq' \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{le' \#2.”}]$

$[\mathsf{x} \leq' \mathsf{y} \overset{\text{pyk}}{\to} \text{“}* \text{ less one } *\text{”}]$

$$\neg *$$

$[\neg \mathsf{x} \overset{\text{val}}{\to} \mathrm{If}(\mathsf{x}, \mathsf{F}, \mathsf{T})]$

$[\neg * \overset{\text{tex}}{\to} \text{“}$
$\{\backslash\text{neg }\}\#1.\text{”}]$

$[\neg * \overset{\text{pyk}}{\to} \text{“not } *\text{”}]$

$$* \bigwedge *$$

$$[\mathsf{x} \wedge \mathsf{y} \overset{\text{val}}{\to} \mathsf{x} \left\{ \begin{array}{l} \mathrm{If}(\mathsf{y}, \mathsf{T}, \mathsf{F}) \\ \mathrm{If}(\mathsf{y}, \mathsf{F}, \mathsf{F}) \end{array} \right.]$$

$[* \wedge * \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{wedge \#2.”}]$

$[* \wedge * \overset{\text{pyk}}{\to} \text{“}* \text{ and } *\text{”}]$

$$* \ddot{\bigwedge} *$$

$[\mathsf{x} \ddot{\wedge} \mathsf{y} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil[\mathsf{x} \ddot{\wedge} \mathsf{y} \doteq \mathrm{If}(\mathsf{x}, \mathsf{y}, \mathsf{F})]\rceil)]$

$[\mathsf{x} \ddot{\wedge} \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$\backslash\text{mathrel}\{\backslash\text{ddot}\{\backslash\text{wedge}\}\} \text{ \#2.”}]$

$[\mathsf{x} \ddot{\wedge} \mathsf{y} \overset{\text{pyk}}{\to} \text{“}* \text{ macro and } *\text{”}]$

$* \mathbin{\tilde{\wedge}} *$

$[\mathsf{x} \mathbin{\tilde{\wedge}} \mathsf{y} \overset{\text{val}}{\to} \mathrm{if}(\mathsf{x}, \mathsf{y}, \mathsf{x})]$

$[\mathsf{x} \mathbin{\tilde{\wedge}} \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\mathrel{\tilde{\wedge}} \#2.”}]$

$[\mathsf{x} \mathbin{\tilde{\wedge}} \mathsf{y} \overset{\text{pyk}}{\to} \text{“}* \text{ simple and } *\text{”}]$

$* \wedge_{\mathsf{c}} *$

$[\mathsf{x} \wedge_{\mathsf{c}} \mathsf{y} \overset{\text{val}}{\to} \lambda \mathsf{t}.\lambda \mathsf{c}.\ [\ [\ [\ \mathsf{x}\ '\mathsf{t}\ ]\ '\mathsf{c}\ ]\ \tilde{\wedge}\ [\ [\ \mathsf{y}\ '\mathsf{t}\ ]\ '\mathsf{c}\ ]\ ]\ ]$

$[\mathsf{x} \wedge_{\mathsf{c}} \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\wedge_c \#2.”}]$

$[\mathsf{x} \wedge_{\mathsf{c}} \mathsf{y} \overset{\text{pyk}}{\to} \text{“}* \text{ claim and } *\text{”}]$

$* \vee *$

$[\mathsf{x} \vee \mathsf{y} \overset{\text{val}}{\to} \mathsf{x} \begin{cases} \mathrm{If}(\mathsf{y}, \mathsf{T}, \mathsf{T}) \\ \mathrm{If}(\mathsf{y}, \mathsf{T}, \mathsf{F}) \end{cases}]$

$[* \vee * \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\vee \#2.”}]$

$[* \vee * \overset{\text{pyk}}{\to} \text{“}* \text{ or } *\text{”}]$

$* \mathbin{\|} *$

$[* \mathbin{\|} * \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\parallel \#2.”}]$

$[* \mathbin{\|} * \overset{\text{pyk}}{\to} \text{“}* \text{ parallel } *\text{”}]$

$* \mathbin{\ddot{\vee}} *$

$[\mathsf{x} \mathbin{\ddot{\vee}} \mathsf{y} \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil [\mathsf{x} \mathbin{\ddot{\vee}} \mathsf{y} \doteq \mathrm{If}(\mathsf{x}, \mathsf{T}, \mathsf{y})] \rceil)]$

$[\mathsf{x} \mathbin{\ddot{\vee}} \mathsf{y} \overset{\text{tex}}{\to} \text{“\#1.}$
$\text{\mathrel{\ddot{\vee}} \#2.”}]$

$[\mathsf{x} \mathbin{\ddot{\vee}} \mathsf{y} \overset{\text{pyk}}{\to} \text{“}* \text{ macro or } *\text{”}]$

$$* \mathrel{\ddot{\Rightarrow}} *$$

$$[\mathsf{x} \mathrel{\ddot{\Rightarrow}} \mathsf{y} \overset{\text{macro}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\mathsf{x} \mathrel{\ddot{\Rightarrow}} \mathsf{y} \mathrel{\ddot{=}} \mathrm{If}(\mathsf{x},\mathsf{y},\mathsf{T})]\rceil)]$$

$$[\mathsf{x} \mathrel{\ddot{\Rightarrow}} \mathsf{y} \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\text{\mathrel{\ddot{\Rightarrow}} \#2.”]}$$

$$[\mathsf{x} \mathrel{\ddot{\Rightarrow}} \mathsf{y} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ macro imply } *\text{”]}$$

$$* : *$$

$$[\mathsf{x} : \mathsf{y} \overset{\text{val}}{\rightarrow} \mathrm{if}(\mathsf{x},\mathsf{y},\mathsf{y})]$$

$$[* : * \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\text{:\#2.”]}$$

$$[* : * \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ guard } *\text{”]}$$

$$*!*$$

$$[\mathsf{x}!\mathsf{y} \overset{\text{val}}{\Rightarrow} \mathrm{If}(\mathsf{x},\mathsf{y},\mathsf{y})]$$

$$[*!* \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\text{!\#2.”]}$$

$$[*!* \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ tagged guard } *\text{”]}$$

$$* \left\{ \begin{array}{l} * \\ * \end{array} \right.$$

$$[\mathsf{x} \left\{ \begin{array}{l} \mathsf{y} \\ \mathsf{z} \end{array} \right. \overset{\text{val}}{\Rightarrow} \mathrm{If}(\mathsf{x},\mathsf{y},\mathsf{z})]$$

$$[* \left\{ \begin{array}{l} * \\ * \end{array} \right. \overset{\text{tex}}{\rightarrow} \text{“\#1.}$$
$$\text{\left\{\protect \begin \{array\}\{l\}\#2.}$$
$$\text{\\\#3.}$$
$$\text{\protect \end \{array\}\right.”]}$$

$$[* \left\{ \begin{array}{l} * \\ * \end{array} \right. \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ select } * \text{ else } * \text{ end select”]}$$

$\lambda * .*$

Predef: lambda

$[\lambda * .* \overset{\text{tex}}{\rightarrow}$ “
\lambda #1.
.#2.”$]$

$[\lambda * .* \overset{\text{pyk}}{\rightarrow}$ “lambda $*$ dot $*$”$]$

$\Lambda *$

$[\Lambda \mathsf{x} \overset{\text{val}}{\Rightarrow} \mathcal{M}(\lambda \mathsf{u}.\mathcal{U}(\mathsf{x}\,\text{'}\,\mathcal{M}(\mathsf{u})))]$

$[\Lambda * \overset{\text{tex}}{\rightarrow}$ “
\Lambda #1.”$]$

$[\Lambda * \overset{\text{pyk}}{\rightarrow}$ “tagging $*$”$]$

if $*$ then $*$ else $*$

$[\textbf{if } \mathsf{x} \textbf{ then } \mathsf{y} \textbf{ else } \mathsf{z} \overset{\text{macro}}{\rightarrow} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\textbf{if } \mathsf{x} \textbf{ then } \mathsf{y} \textbf{ else } \mathsf{z} \doteqdot \mathrm{If}(\mathsf{x},\mathsf{y},\mathsf{z})]\rceil)]$

$[\textbf{if } \mathsf{x} \textbf{ then } \mathsf{y} \textbf{ else } \mathsf{z} \overset{\text{tex}}{\rightarrow}$ “
{\bf if} \ #1.
\ {\bf then} \ #2.
\ {\bf else} \ #3.”$]$

$[\textbf{if } \mathsf{x} \textbf{ then } \mathsf{y} \textbf{ else } \mathsf{z} \overset{\text{pyk}}{\rightarrow}$ “open if $*$ then $*$ else $*$”$]$

let $*$ = $*$ in $*$

$[\textbf{let } \mathsf{x} = \mathsf{y} \textbf{ in } \mathsf{z} \overset{\text{macro}}{\rightarrow} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\lceil[\textbf{let } \mathsf{x} = \mathsf{y} \textbf{ in } \mathsf{z} \doteqdot \mathrm{let}_1(\lambda \mathsf{x}.\mathsf{z},\mathsf{y})]\rceil)]$

$[\textbf{let } \mathsf{x} = \mathsf{y} \textbf{ in } \mathsf{z} \overset{\text{tex}}{\rightarrow}$ “
\mathbf{let\ } #1.
= #2.
\mathbf{\ in\ } #3.”$]$

$[\textbf{let } \mathsf{x} = \mathsf{y} \textbf{ in } \mathsf{z} \overset{\text{pyk}}{\rightarrow}$ “let $*$ be $*$ in $*$”$]$

$\mathbf{let}\ *\ \ddot{=}\ *\ \ \mathrm{in}\ \ *$

$[\mathbf{let}\ \mathsf{x} \ddot{=} \mathsf{y}\ \ \mathrm{in}\ \ \mathsf{z} \overset{\mathrm{macro}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.$
$\tilde{\mathcal{M}}(\mathsf{t}^3, \mathsf{s}, \mathsf{c}[\mathsf{t}^{1\mathrm{r}} :: [\ \texttt{"codex"} :: [\ \mathsf{t}^{1\mathrm{r}} :: [\ \mathsf{t}^{1\mathrm{i}} :: [\ 0 :: [\ \texttt{"macro"} :: \mathsf{T}\ ]\ ]\ ]\ ]\ ]$
$\Rightarrow \tilde{\mathcal{M}}_3(\mathsf{t})])]$

$[\mathbf{let}\ \mathsf{x} \ddot{=} \mathsf{y}\ \ \mathrm{in}\ \ \mathsf{z} \overset{\mathrm{tex}}{\rightarrow}$ “
\mathbf{let\ } #1.
\mathrel{\ddot{=}} #2.
\mathrel{\ in\ } #3.”]

$[\mathbf{let}\ \mathsf{x} \ddot{=} \mathsf{y}\ \ \mathrm{in}\ \ \mathsf{z} \overset{\mathrm{pyk}}{\rightarrow}$ “let $*$ abbreviate $*$ in $*$”]

$*^{\mathrm{I}}$

$[\mathsf{x}^{\mathrm{I}} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x}^{\mathrm{I}} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: \mathsf{T}\ ]\ ]$

$[\mathsf{x}^{\mathrm{I}} \overset{\mathrm{tex}}{\rightarrow}$ “#1.
{} ^ { I }”]

$[\mathsf{x}^{\mathrm{I}} \overset{\mathrm{pyk}}{\rightarrow}$ “$*$ init”]

$*^{\triangleright}$

$[\mathsf{x}^{\triangleright} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x}^{\triangleright} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: \mathsf{T}\ ]\ ]$

$[\mathsf{x}^{\triangleright} \overset{\mathrm{tex}}{\rightarrow}$ “#1.
{} ^ { \rhd }”]

$[\mathsf{x}^{\triangleright} \overset{\mathrm{pyk}}{\rightarrow}$ “$*$ modus”]

$*^{\mathrm{V}}$

$[\mathsf{x}^{\mathrm{V}} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x}^{\mathrm{V}} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: \mathsf{T}\ ]\ ]$

$[\mathsf{x}^{\mathrm{V}} \overset{\mathrm{tex}}{\rightarrow}$ “#1.
{} ^ { V } ”]

$[\mathsf{x}^{\mathrm{V}} \overset{\mathrm{pyk}}{\rightarrow}$ “$*$ verify”]

$*^{+}$

$[\mathsf{x}^{+} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x}^{+} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: \mathsf{T}\ ]\ ]$

$[\mathsf{x}^{+} \overset{\text{tex}}{\rightarrow} \text{“\#1.}$
$\{\}\ \hat{}\ \{\ +\ \}\ \text{”}]$

$[\mathsf{x}^{+} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ curry plus”}]$

$*^{-}$

$[\mathsf{x}^{-} \overset{\text{val}}{\rightarrow} \lceil \mathsf{x}^{-} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: \mathsf{T}\ ]\ ]$

$[\mathsf{x}^{-} \overset{\text{tex}}{\rightarrow} \text{“\#1.}$
$\{\}\ \hat{}\ \{\ -\ \}\ \text{”}]$

$[\mathsf{x}^{-} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ curry minus”}]$

$*^{*}$

$[\mathsf{x}^{*} \overset{\text{val}}{\rightarrow} \lceil \mathsf{x}^{*} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: \mathsf{T}\ ]\ ]$

$[\mathsf{x}^{*} \overset{\text{tex}}{\rightarrow} \text{“\#1.}$
$\{\}\ \hat{}\ \{\ \backslash\text{ast}\ \}\ \text{”}]$

$[\mathsf{x}^{*} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ dereference”}]$

$* \mathbin{@} *$

$[\mathsf{x} \mathbin{@} \mathsf{y} \overset{\text{val}}{\rightarrow} \lceil \mathsf{x} \mathbin{@} \mathsf{y} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: [\ \mathsf{y} :: \mathsf{T}\ ]\ ]\ ]$

$[\mathsf{x} \mathbin{@} \mathsf{y} \overset{\text{tex}}{\rightarrow} \text{“\#1.}$
$\backslash\text{mathop } \{\backslash\text{char64}\}\ \#2.\text{”}]$

$[\mathsf{x} \mathbin{@} \mathsf{y} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ at } *\text{”}]$

$* \rhd *$

$[\mathsf{x} \rhd \mathsf{y} \overset{\text{val}}{\rightarrow} \lceil \mathsf{x} \rhd \mathsf{y} \rceil^{\mathrm{R}} :: [\ \mathsf{x} :: [\ \mathsf{y} :: \mathsf{T}\ ]\ ]\ ]$

$[\mathsf{x} \rhd \mathsf{y} \overset{\text{tex}}{\rightarrow} \text{“\#1.}$
$\backslash\text{rhd } \#2.\text{”}]$

$[\mathsf{x} \rhd \mathsf{y} \overset{\text{pyk}}{\rightarrow} \text{“}* \text{ modus ponens } *\text{”}]$

$* \Rrightarrow *$

$[\mathsf{x} \Rrightarrow \mathsf{y} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x} \Rrightarrow \mathsf{y} \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: [\, \mathsf{y} :: \mathsf{T} \,] \,] \,]$

$[\mathsf{x} \Rrightarrow \mathsf{y} \overset{\mathrm{tex}}{\rightarrow} \text{“\#1.}$
$\backslash\mathrm{mathrel}\ \{\backslash\mathrm{makebox}\ [0\mathrm{mm}][\mathrm{l}]\{\$\backslash\mathrm{rhd}\ \$\}\backslash,\{\backslash\mathrm{rhd}\ \}\}\ \#2.\text{”}]$

$[\mathsf{x} \Rrightarrow \mathsf{y} \overset{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ modus probans } *\text{”}]$

$* \gg *$

$[\mathsf{x} \gg \mathsf{y} \overset{\mathrm{tactic}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\mathrm{conclude}_1(\mathsf{t},\mathsf{c})]$

$[\mathsf{x} \gg \mathsf{y} \overset{\mathrm{tex}}{\rightarrow} \text{“\#1.}$
$\backslash\mathrm{gg}\ \#2.\text{”}]$

$[\mathsf{x} \gg \mathsf{y} \overset{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ conclude } *\text{”}]$

$* \vdash *$

$[\mathsf{x} \vdash \mathsf{y} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x} \vdash \mathsf{y} \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: [\, \mathsf{y} :: \mathsf{T} \,] \,] \,]$

$[\mathsf{x} \vdash \mathsf{y} \overset{\mathrm{tex}}{\rightarrow} \text{“\#1.}$
$\backslash\mathrm{vdash}\ \#2.\text{”}]$

$[\mathsf{x} \vdash \mathsf{y} \overset{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ infer } *\text{”}]$

$* \Vdash *$

$[\mathsf{x} \Vdash \mathsf{y} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x} \Vdash \mathsf{y} \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: [\, \mathsf{y} :: \mathsf{T} \,] \,] \,]$

$[\mathsf{x} \Vdash \mathsf{y} \overset{\mathrm{tex}}{\rightarrow} \text{“\#1.}$
$\backslash\mathrm{mathrel}\ \{\backslash\mathrm{makebox}\ [0\mathrm{mm}][\mathrm{l}]\{\$\backslash\mathrm{vdash}\ \$\}\backslash,\{\backslash\mathrm{vdash}\ \}\}\ \#2.\text{”}]$

$[\mathsf{x} \Vdash \mathsf{y} \overset{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ endorse } *\text{”}]$

$* \text{ i.e. } *$

$[\mathsf{x}\ \mathrm{i.e.}\ \mathsf{y} \overset{\mathrm{val}}{\rightarrow} \lceil \mathsf{x}\ \mathrm{i.e.}\ \mathsf{y} \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: [\, \mathsf{y} :: \mathsf{T} \,] \,] \,]$

$[\mathsf{x}\ \mathrm{i.e.}\ \mathsf{y} \overset{\mathrm{tex}}{\rightarrow} \text{“\#1.}$
$\backslash\mathrm{mathrel}\ \{\mathrm{i.e.}\}\ \#2.\text{”}]$

$[\mathsf{x}\ \mathrm{i.e.}\ \mathsf{y} \overset{\mathrm{pyk}}{\rightarrow} \text{“}* \text{ id est } *\text{”}]$

$\forall * : *$

$[\forall \mathsf{x} : \mathsf{y} \overset{\text{val}}{\to} \lceil \forall \mathsf{x} : \mathsf{y} \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: [\, \mathsf{y} :: \mathsf{T} \,] \,] \,]$

$[\forall \mathsf{x} : \mathsf{y} \overset{\text{tex}}{\to}$ “
\forall #1.
\colon #2.”]

$[\forall \mathsf{x} : \mathsf{y} \overset{\text{pyk}}{\to}$ “all $*$ indeed $*$”]

$* \oplus *$

$[\mathsf{x} \oplus \mathsf{y} \overset{\text{val}}{\to} \lceil \mathsf{x} \oplus \mathsf{y} \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: [\, \mathsf{y} :: \mathsf{T} \,] \,] \,]$

$[\mathsf{x} \oplus \mathsf{y} \overset{\text{tex}}{\to}$ “#1.
\mathrel {\oplus} #2.”]

$[\mathsf{x} \oplus \mathsf{y} \overset{\text{pyk}}{\to}$ “$*$ rule plus $*$”]

$*\mathbin{;} *$

$[\mathsf{x} ; \mathsf{y} \overset{\text{val}}{\to} \lceil \mathsf{x} ; \mathsf{y} \rceil^{\mathrm{R}} :: [\, \mathsf{x} :: [\, \mathsf{y} :: \mathsf{T} \,] \,] \,]$

$[\mathsf{x} ; \mathsf{y} \overset{\text{tex}}{\to}$ “#1.
; #2.”]

$[\mathsf{x} ; \mathsf{y} \overset{\text{pyk}}{\to}$ “$*$ cut $*$”]

$*$ proves $*$

$[\mathsf{p} \text{ proves } \mathsf{t} \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil [\mathsf{p} \text{ proves } \mathsf{t} \doteq \text{proof}(\lceil \mathsf{p} \rceil, \lceil \mathsf{t} \rceil, \text{self})] \rceil)]$

$[\mathsf{p} \text{ proves } \mathsf{t} \overset{\text{tex}}{\to}$ “#1.
\ proves\ #2.”]

$[\mathsf{x} \text{ proves } \mathsf{y} \overset{\text{pyk}}{\to}$ “$*$ proves $*$”]

$*$ **proof of** $* : *$

$[\mathsf{t} \textbf{ proof of } \mathsf{s} : \mathsf{p} \overset{\text{name}}{\to}$ “#1.
\mathbf{\ proof\ of\ } #2.
: #3.”]

$[\mathsf{t}\ \textbf{proof of}\ \mathsf{s} : \mathsf{p} \overset{\text{macro}}{\rightarrow} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t},\mathsf{s},\mathsf{c},\ulcorner[\mathsf{t}\ \textbf{proof of}\ \mathsf{s} : \mathsf{p} \ddot{=} [\textbf{Proof of}\ \mathsf{s}\colon \lambda\mathsf{c}.\lambda\mathsf{x}.\mathcal{P}(\ulcorner\mathsf{t} \vdash \mathsf{p}\urcorner, \mathrm{p}_0, \mathsf{c})]]\urcorner)]$

$[\mathsf{t}\ \textbf{proof of}\ \mathsf{s} : \mathsf{p} \overset{\text{tex}}{\rightarrow}$ “

```
\if\relax\csname lgwprooflinep\endcsname
\def\lgwprooflinep{x}
\newcount\lgwproofline
\fi
\begingroup
\def\insideproof{x}
\lgwproofline=0 #1.
\mathbf {\ proof\ of\ } #2.
\colon #3.
\gdef\lgwella{\relax}
\gdef\lgwellb{\relax}
\gdef\lgwellc{\relax}
\gdef\lgwelld{\relax}
\gdef\lgwelle{\relax}
\gdef\lgwellf{\relax}
\gdef\lgwellg{\relax}
\gdef\lgwellh{\relax}
\gdef\lgwelli{\relax}
\gdef\lgwellj{\relax}
\gdef\lgwellk{\relax}
\gdef\lgwelll{\relax}
\gdef\lgwellm{\relax}
\gdef\lgwelln{\relax}
\gdef\lgwello{\relax}
\gdef\lgwellp{\relax}
\gdef\lgwellq{\relax}
\gdef\lgwellr{\relax}
\gdef\lgwells{\relax}
\gdef\lgwellt{\relax}
\gdef\lgwellu{\relax}
\gdef\lgwellv{\relax}
\gdef\lgwellw{\relax}
\gdef\lgwellx{\relax}
\gdef\lgwelly{\relax}
\gdef\lgwellz{\relax}
\gdef\lgwellbiga{\relax}
\gdef\lgwellbigb{\relax}
\gdef\lgwellbigc{\relax}
\gdef\lgwellbigd{\relax}
\gdef\lgwellbige{\relax}
\gdef\lgwellbigf{\relax}
\gdef\lgwellbigg{\relax}
```

```
\gdef\lgwellbigh{\relax}
\gdef\lgwellbigi{\relax}
\gdef\lgwellbigj{\relax}
\gdef\lgwellbigk{\relax}
\gdef\lgwellbigl{\relax}
\gdef\lgwellbigm{\relax}
\gdef\lgwellbign{\relax}
\gdef\lgwellbigo{\relax}
\gdef\lgwellbigp{\relax}
\gdef\lgwellbigq{\relax}
\gdef\lgwellbigr{\relax}
\gdef\lgwellbigs{\relax}
\gdef\lgwellbigt{\relax}
\gdef\lgwellbigu{\relax}
\gdef\lgwellbigv{\relax}
\gdef\lgwellbigw{\relax}
\gdef\lgwellbigx{\relax}
\gdef\lgwellbigy{\relax}
\gdef\lgwellbigz{\relax}
\endgroup "]
```

[t **proof of** $\mathsf{l} : \mathsf{p} \overset{\text{pyk}}{\to}$ "$*$ proof of $*$ reads $*$"]

Line $* : * \gg *; *$

[Line $\mathsf{l} : \mathsf{a} \gg \mathsf{i}; \mathsf{p} \overset{\text{name}}{\to}$ "
Line \, #1.
: #2.
\gg #3.
; #4."]

[Line $\mathsf{l} : \mathsf{a} \gg \mathsf{i}; \mathsf{p} \overset{\text{macro}}{\to} \lambda\mathsf{t}.\lambda\mathsf{s}.\lambda\mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil$[Line $\mathsf{l} : \mathsf{a} \gg \mathsf{i}; \mathsf{p} \doteq$ ([$\mathsf{a} \gg \mathsf{i}$] ; **let** $\mathsf{l} \doteq \mathsf{i}$ in p)]$\rceil$)]

[Line $\mathsf{l} : \mathsf{a} \gg \mathsf{i}; \mathsf{p} \overset{\text{tex}}{\to}$ "
\newline \makebox [0.1\textwidth]{}%
\parbox [b]{0.4\textwidth }{\raggedright
\setlength {\parindent }{-0.1\textwidth }%
\makebox [0.1\textwidth][l]{$#1.
$:}$#2.
{}\gg {}$}\quad
\parbox [t]{0.4\textwidth }{$#3.
$\hfill \makebox [0mm][l]{\quad ;}}#4."]

[Line $\mathsf{l} : \mathsf{a} \gg \mathsf{i}; \mathsf{p} \overset{\text{pyk}}{\to}$ "line $*$ because $*$ indeed $*$ end line $*$"]

Last line $* \gg * \Box$

$[\text{Last line}\, \mathsf{a} \gg \mathsf{i} \Box \overset{\text{name}}{\to}$ “
Last\ line \, #1.
\gg #2.
\, \Box”$]$

$[\text{Last line}\, \mathsf{a} \gg \mathsf{i} \Box \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \ulcorner[\text{Last line}\, \mathsf{a} \gg \mathsf{i} \Box \doteqdot (\mathsf{a} \gg \mathsf{i})]\urcorner)]$

$[\text{Last line}\, \mathsf{a} \gg \mathsf{i} \Box \overset{\text{tex}}{\to}$ “
\newline \makebox [0.1\textwidth]{}%
\parbox [b]{0.4\textwidth }{\raggedright
\setlength {\parindent }{-0.1\textwidth }%
\makebox [0.1\textwidth][l]{$
\if \relax \csname lgwprooflinep\endcsname L_? \else
\global \advance \lgwproofline by 1
L\ifnum \lgwproofline <10 0\fi \number \lgwproofline
\fi
$:}$#1.
{}\gg {}$}\quad
\parbox [t]{0.4\textwidth }{$#2.
$\hfill \makebox [0mm][l]{\quad \makebox[0mm]{$\Box$}}}”$]$

$[\text{Last line}\, \mathsf{a} \gg \mathsf{i} \Box \overset{\text{pyk}}{\to}$ “because $*$ indeed $*$ qed”$]$

Line $*$: Premise $\gg *; *$

$[\text{Line}\, \mathsf{l} : \text{Premise} \gg \mathsf{i}; \mathsf{p} \overset{\text{name}}{\to}$ “
Line \, #1.
: Premise \gg #2.
;#3.”$]$

$[\text{Line}\, \mathsf{l} : \text{Premise} \gg \mathsf{i}; \mathsf{p} \overset{\text{macro}}{\to} \lambda \mathsf{t}.\lambda \mathsf{s}.\lambda \mathsf{c}.\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \ulcorner[\text{Line}\, \mathsf{l} : \text{Premise} \gg \mathsf{i}; \mathsf{p} \doteqdot (\mathsf{i} \vdash \textbf{let}\ \mathsf{l} \doteqdot \mathsf{i}\ \text{ in }\ \mathsf{p})]\urcorner)]$

$[\text{Line}\, \mathsf{l} : \text{Premise} \gg \mathsf{i}; \mathsf{p} \overset{\text{tex}}{\to}$ “
\newline \makebox [0.1\textwidth][l]{$#1.
$:}\makebox [0.4\textwidth][l]{$Premise{}\gg{}$}\quad
\parbox [t]{0.4\textwidth }{$#2.
$\hfill \makebox [0mm][l]{\quad ;}}#3.”$]$

$[\text{Line}\, \mathsf{l} : \text{Premise} \gg \mathsf{i}; \mathsf{p} \overset{\text{pyk}}{\to}$ “line $*$ premise $*$ end line $*$”$]$

Line $*$: **Side-condition** $\gg *; *$

[Line l : Side-condition $\gg$ i; p $\overset{\text{name}}{\rightarrow}$ “
Line \, #1.
: \mbox{Side-condition} \gg #2.
; #3.”]

[Line l : Side-condition $\gg$ i; p $\overset{\text{macro}}{\rightarrow}$ λt.λs.λc.$\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil$[Line l : Side-condition $\gg$ i; p $\doteqdot$ (i $\Vdash$ **let** $\mathsf{l} \doteqdot$ i in p)]$\rceil$)]

[Line l : Side-condition $\gg$ i; p $\overset{\text{tex}}{\rightarrow}$ “
\newline \makebox [0.1\textwidth][l]{$#1.
$:}\makebox [0.4\textwidth][l]{
$\mbox{Side-condition}{}\gg{}$}\quad
\parbox [t]{0.4\textwidth }{$#2.
$\hfill \makebox [0mm][l]{\quad ;}}#3.”]

[Line l : Side-condition $\gg$ i; p $\overset{\text{pyk}}{\rightarrow}$ “line $*$ side condition $*$ end line $*$”]

Arbitrary $\gg *; *$

[Arbitrary $\gg$ i; p $\overset{\text{name}}{\rightarrow}$ “
Arbitrary \gg #1.
; #2.”]

[Arbitrary $\gg$ i; p $\overset{\text{macro}}{\rightarrow}$ λt.λs.λc.$\tilde{\mathcal{M}}_4(\mathsf{t}, \mathsf{s}, \mathsf{c}, \lceil$[Arbitrary $\gg$ i; p $\doteqdot$ ($\forall$i: p)]$\rceil$)]

[Arbitrary $\gg$ i; p $\overset{\text{tex}}{\rightarrow}$ “
\newline \makebox [0.1\textwidth][l]{$
\if \relax \csname lgwprooflinep\endcsname L_? \else
\global \advance \lgwproofline by 1
L\ifnum \lgwproofline <10 0\fi \number \lgwproofline
\fi
$:}\makebox [0.4\textwidth][l]{$Arbitrary{}\gg{}$}\quad
\parbox [t]{0.4\textwidth }{$#1.
$\hfill \makebox [0mm][l]{\quad ;}}#2.”]

[Arbitrary $\gg$ i; p $\overset{\text{pyk}}{\rightarrow}$ “arbitrary $*$ end line $*$”]

Local $\gg * = *; *$

[Local $\gg$ a = i; p $\overset{\text{name}}{\rightarrow}$ “
Local \gg #1.
= #2.
; #3.”]

$[\mathsf{Local} \gg \mathsf{a} = \mathsf{i}; \mathsf{p} \overset{\text{macro}}{\rightarrow} \lambda t.\lambda s.\lambda c.\tilde{\mathcal{M}}_4(t, s, c, \lceil[\mathsf{Local} \gg \mathsf{a} = \mathsf{i}; \mathsf{p} \doteqdot (\textbf{let } \mathsf{a} \doteqdot \mathsf{i} \text{ in } \mathsf{p})]\rceil)]$

$[\mathsf{Local} \gg \mathsf{a} = \mathsf{i}; \mathsf{p} \overset{\text{tex}}{\rightarrow}$ “
\newline\makebox[0.1\textwidth]{$
\if \relax \csname lgwprooflinep\endcsname L_? \else
\global \advance \lgwproofline by 1
L\ifnum \lgwproofline <10 0\fi \number \lgwproofline
\fi
$:}%
\makebox[0.4\textwidth]{$Local{}\gg{}$}%
\quad%
\parbox[t]{0.4\textwidth}{$#1.
= #2.
$\hfill\makebox[0mm][l]{\quad ;}}#3.”]

$[\mathsf{Local} \gg \mathsf{u} = \mathsf{v}; \mathsf{p} \overset{\text{pyk}}{\rightarrow}$ “locally define ∗ as ∗ end line ∗”]

∗&∗

[∗&∗ $\overset{\text{name}}{\rightarrow}$ “#1.
\& #2.”]

[∗&∗ $\overset{\text{tex}}{\rightarrow}$ “#1.
&#2.”]

[∗&∗ $\overset{\text{pyk}}{\rightarrow}$ “∗ tab ∗”]

∗\\∗

[∗\\∗ $\overset{\text{name}}{\rightarrow}$ “#1.
\backslash \backslash #2.”]

[∗\\∗ $\overset{\text{tex}}{\rightarrow}$ “#1.
\\ #2.”]

[∗\\∗ $\overset{\text{pyk}}{\rightarrow}$ “∗ row

∗”]

The pyk compiler, version 0.grue.20050603 by Klaus Grue
GRD-2005-06-03.UTC:15:49:33.495567 = MJD-53524.TAI:15:50:05.495567 = LGT-4624530605495567e-6