Logiweb codex of finalversion

$* \Rightarrow *$, finalversion, pred calc, pc1, pc2, pc3, pc4, pc5, pc6, pc7, pc8, pc9, pc10, pc11, pc12, pcmp, pcunsound, pcia, pcie, pcdeduction, trivia, repeat, andintro, andelim1, andelim2, orintro1, orintro2, orelim, notintro, implyintro, notnotintro, notnotelim, mt, pbc, lem, forallintro, forallelim, existsintro, existselim, bottomelim, lemnotintro, hlplem1, hlplem2, hlplem3, hlplem4, hlplem5, goal1, hlplem6, goal2, $* \equiv *$, $* = *$, $\neg *$, $* \wedge *$, $* \vee *$, $\forall * . (*)$, $\exists * . (*)$, $* \in *$,

$* \Rightarrow *$

$[\mathsf{x} \Rightarrow \mathsf{y} \overset{\text{tex}}{\rightarrow}$ "#1. \Rightarrow #2."]

finalversion

[finalversion $\overset{\text{prio}}{\rightarrow}$
Preassociative
[finalversion], [base], [bracket $*$ end bracket], [big bracket $*$ end bracket], [$\$ * \$$], [**flush left** [$*$]], [x], [y], [z], [[$* \bowtie *$]], [[$* \overset{*}{\Rightarrow} *$]], [pyk], [tex], [name], [prio], [$*$], [T], [if($*,*,*$)], [[$* \overset{*}{\Rightarrow} *$]], [val], [claim], [$\bot$], [f($*$)], [($*$)$^{\mathrm{I}}$], [F], [$\underline{0}$], [$\underline{1}$], [$\underline{2}$], [$\underline{3}$], [$\underline{4}$], [$\underline{5}$], [$\underline{6}$], [$\underline{7}$], [$\underline{8}$], [$\underline{9}$], [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], [$\langle * | * := * \rangle$], [$\mathcal{M}(*)$], [$\tilde{\mathcal{U}}(*)$], [$\mathcal{U}(*)$], [$\mathcal{U}^{\mathrm{M}}(*)$], [**apply**($*,*$)], [**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"], [$\mathcal{E}(*,*,*)$], [$\mathcal{E}_2(*,*,*,*,*)$], [$\mathcal{E}_3(*,*,*,*)$], [$\mathcal{E}_4(*,*,*,*)$], [**lookup**($*,*,*$)], [**abstract**($*,*,*,*$)], [[$\lceil * \rceil$]], [$\mathcal{M}(*,*,*)$], [$\mathcal{M}_2(*,*,*,*)$], [$\mathcal{M}^*(*,*,*)$], [macro], [s$_0$], [**zip**($*,*$)], [**assoc**$_1$($*,*,*$)], [($*$)$^{\mathbf{P}}$], [self], [[$* \overset{.}{=} *$]], [[$* \overset{.}{=} *$]], [[$* \overset{.}{=} *$]], [[$* \overset{\mathrm{pyk}}{=} *$]], [[$* \overset{\mathrm{tex}}{=} *$]], [[$* \overset{\mathrm{name}}{=} *$]], [**Priority table**[$*$]], [$\tilde{\mathcal{M}}_1$], [$\tilde{\mathcal{M}}_2(*)$], [$\tilde{\mathcal{M}}_3(*)$], [$\tilde{\mathcal{M}}_4(*,*,*,*)$], [$\mathcal{M}(*,*,*)$], [$\tilde{\mathcal{Q}}(*,*,*)$], [$\tilde{\mathcal{Q}}_2(*,*,*)$], [$\tilde{\mathcal{Q}}_3(*,*,*,*)$], [$\tilde{\mathcal{Q}}^*(*,*,*)$], [($*$)], [($*$)], [display($*$)], [statement($*$)], [[$*$]`], [[$*$]$^-$], [**aspect**($*,*$)], [**aspect**($*,*,*$)], [$\langle * \rangle$], [**tuple**$_1$($*$)], [**tuple**$_2$($*$)], [let$_2$($*,*$)], [let$_1$($*,*$)],

$[[* \overset{\text{claim}}{=} *]]$, [checker], $[\textbf{check}(*,*)]$, $[\textbf{check}_2(*,*,*)]$, $[\textbf{check}_3(*,*,*)]$,
$[\textbf{check}^*(*,*)]$, $[\textbf{check}_2^*(*,*,*)]$, $[[*]^{\cdot}]$, $[[*]^{-}]$, $[[*]^{\circ}]$, [msg], $[[* \overset{\text{msg}}{=} *]]$, $[<\text{stmt}>]$,
[stmt], $[[* \overset{\text{stmt}}{=} *]]$, [HeadNil'], [HeadPair'], [Transitivity'], $[\perp\!\!\!\perp]$, [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],
$[(*)^{\mathbf{v}}]$, $[\text{intro}(*,*,*,*)]$, $[\text{intro}(*,*,*)]$, $[\text{error}(*,*,*)]$, $[\text{error}_2(*,*)]$, $[\text{proof}(*,*,*)]$,
$[\text{proof}_2(*,*,*)]$, $[\mathcal{S}(*,*)]$, $[\mathcal{S}^{\text{I}}(*,*)]$, $[\mathcal{S}^{\triangleright}(*,*)]$, $[\mathcal{S}_1^{\triangleright}(*,*,*)]$, $[\mathcal{S}^{\text{E}}(*,*)]$, $[\mathcal{S}_1^{\text{E}}(*,*,*)]$,
$[\mathcal{S}^+(*,*)]$, $[\mathcal{S}_1^+(*,*,*)]$, $[\mathcal{S}^-(*,*)]$, $[\mathcal{S}_1^-(*,*,*)]$, $[\mathcal{S}^*(*,*)]$, $[\mathcal{S}_1^*(*,*,*)]$,
$[\mathcal{S}_2^*(*,*,*,*)]$, $[\mathcal{S}^{@}(*,*)]$, $[\mathcal{S}_1^{@}(*,*,*)]$, $[\mathcal{S}^{\vdash}(*,*)]$, $[\mathcal{S}_1^{\vdash}(*,*,*)]$, $[\mathcal{S}^{\Vdash}(*,*)]$,
$[\mathcal{S}_1^{\Vdash}(*,*,*,*)]$, $[\mathcal{S}^{\text{i.e.}}(*,*)]$, $[\mathcal{S}_1^{\text{i.e.}}(*,*,*,*)]$, $[\mathcal{S}_2^{\text{i.e.}}(*,*,*,*)]$, $[\mathcal{S}^{\forall}(*,*)]$,
$[\mathcal{S}_1^{\forall}(*,*,*,*)]$, $[\mathcal{S}^{:}(*,*)]$, $[\mathcal{S}_1^{:}(*,*,*)]$, $[\mathcal{S}_2^{:}(*,*,*,*)]$, $[\mathcal{T}(*)]$, $[\text{claims}(*,*,*)]$,
$[\text{claims}_2(*,*,*)]$, $[<\text{proof}>]$, [proof], $[[\textbf{Lemma} *:*]]$, $[[\textbf{Proof of} *:*]]$,
$[[* \textbf{lemma} *:*]]$, $[[* \textbf{antilemma} *:*]]$, $[[* \textbf{rule} *:*]]$, $[[* \textbf{antirule} *:*]]$,
[verifier], $[\mathcal{V}_1(*)]$, $[\mathcal{V}_2(*,*)]$, $[\mathcal{V}_3(*,*,*,*)]$, $[\mathcal{V}_4(*,*)]$, $[\mathcal{V}_5(*,*,*,*)]$, $[\mathcal{V}_6(*,*,*,*)]$,
$[\mathcal{V}_7(*,*,*,*)]$, $[\text{Cut}(*,*)]$, $[\text{Head}_{\oplus}(*)]$, $[\text{Tail}_{\oplus}(*)]$, $[\text{rule}_1(*,*)]$, $[\text{rule}(*,*)]$,
[Rule tactic], $[\text{Plus}(*,*)]$, $[[\textbf{Theory} *]]$, $[\text{theory}_2(*,*)]$, $[\text{theory}_3(*,*)]$,
$[\text{theory}_4(*,*,*)]$, [HeadNil''], [HeadPair''], [Transitivity''], [Contra''], [HeadNil],
[HeadPair], [Transitivity], [Contra], $[T_E]$, [ragged right],
[ragged right expansion], $[\text{parm}(*,*,*)]$, $[\text{parm}^*(*,*,*)]$, $[\text{inst}(*,*)]$,
$[\text{inst}^*(*,*)]$, $[\text{occur}(*,*,*)]$, $[\text{occur}^*(*,*,*)]$, $[\text{unify}(* = *,*)]$, $[\text{unify}^*(* = *,*)]$,
$[\text{unify}_2(* = *,*)]$, $[L_a]$, $[L_b]$, $[L_c]$, $[L_d]$, $[L_e]$, $[L_f]$, $[L_g]$, $[L_h]$, $[L_i]$, $[L_j]$, $[L_k]$, $[L_l]$, $[L_m]$,
$[L_n]$, $[L_o]$, $[L_p]$, $[L_q]$, $[L_r]$, $[L_s]$, $[L_t]$, $[L_u]$, $[L_v]$, $[L_w]$, $[L_x]$, $[L_y]$, $[L_z]$, $[L_A]$, $[L_B]$, $[L_C]$,
$[L_D]$, $[L_E]$, $[L_F]$, $[L_G]$, $[L_H]$, $[L_I]$, $[L_J]$, $[L_K]$, $[L_L]$, $[L_M]$, $[L_N]$, $[L_O]$, $[L_P]$, $[L_Q]$, $[L_R]$,
$[L_S]$, $[L_T]$, $[L_U]$, $[L_V]$, $[L_W]$, $[L_X]$, $[L_Y]$, $[L_Z]$, $[L_?]$, [Reflexivity], [Reflexivity$_1$],
[Commutativity], [Commutativity$_1$], $[<\text{tactic}>]$, [tactic], $[[* \overset{\text{tactic}}{=} *]]$, $[\mathcal{P}(*,*,*)]$,
$[\mathcal{P}^*(*,*,*)]$, $[p_0]$, $[\text{conclude}_1(*,*)]$, $[\text{conclude}_2(*,*,*)]$, $[\text{conclude}_3(*,*,*,*)]$,
$[\text{conclude}_4(*,*)]$, [check], $[[* \overset{\circ}{=} *]]$, $[\text{RootVisible}(*)]$, [A], [R], [C], [T], [L], $[\{*\}]$, $[\overline{*}]$,
$[a]$, $[b]$, $[c]$, $[d]$, $[e]$, $[f]$, $[g]$, $[h]$, $[i]$, $[j]$, $[k]$, $[l]$, $[m]$, $[n]$, $[o]$, $[p]$, $[q]$, $[r]$, $[s]$, $[t]$, $[u]$, $[v]$,
$[w]$, $[x]$, $[y]$, $[z]$, $[\langle * \equiv * \mid * := *\rangle]$, $[\langle * \equiv^0 * \mid * := *\rangle]$, $[\langle * \equiv^1 * \mid * := *\rangle]$, $[\langle * \equiv^* * \mid * := *\rangle]$,
$[\text{Ded}(*,*)]$, $[\text{Ded}_0(*,*)]$, $[\text{Ded}_1(*,*,*)]$, $[\text{Ded}_2(*,*,*)]$, $[\text{Ded}_3(*,*,*,*)]$,
$[\text{Ded}_4(*,*,*)]$, $[\text{Ded}_4^*(*,*,*,*)]$, $[\text{Ded}_5(*,*,*)]$, $[\text{Ded}_6(*,*,*,*)]$,
$[\text{Ded}_6^*(*,*,*,*)]$, $[\text{Ded}_7(*)]$, $[\text{Ded}_8(*,*)]$, $[\text{Ded}_8^*(*,*)]$, [S], [Neg], [MP], [Gen],
[Ded], [S1], [S2], [S3], [S4], [S5], [S6], [S7], [S8], [S9], [Repetition], [A1'], [A2'], [A4'],
[A5'], [Prop 3.2a], [Prop 3.2b], [Prop 3.2c], [Prop 3.2d], [Prop 3.2e$_1$], [Prop 3.2e$_2$],
[Prop 3.2e], [Prop 3.2f$_1$], [Prop 3.2f$_2$], [Prop 3.2f], [Prop 3.2g$_1$], [Prop 3.2g$_2$],
[Prop 3.2g], [Prop 3.2h$_1$], [Prop 3.2h$_2$], [Prop 3.2h], $[\text{Block}_1(*,*,*)]$, $[\text{Block}_2(*)]$,
[pred calc], [pc1], [pc2], [pc3], [pc4], [pc5], [pc6], [pc7], [pc8], [pc9], [pc10], [pc11],
[pc12], [pcmp], [pcunsound], [pcia], [pcie], [pcdeduction], [trivia], [repeat],
[andintro], [andelim1], [andelim2], [orintro1], [orintro2], [orelim], [notintro],
[implyintro], [notnotintro], [notnotelim], [mt], [pbc], [lem], [forallintro],
[forallelim], [existsintro], [existselim], [bottomelim], [lemnotintro], [hlplem1],
[hlplem2], [hlplem3], [hlplem4], [hlplem5], [goal1], [hlplem6], [goal2];

Preassociative

$[*_-\{*\}]$, $[*/\text{indexintro}(*,*,*,*)]$, $[*/\text{intro}(*,*,*)]$, $[*/\text{bothintro}(*,*,*,*,*)]$,
$[*/\text{nameintro}(*,*,*,*)]$, $[*']$, $[*[*]]$, $[*[* \to *]]$, $[*[* \Rightarrow *]]$, $[*0]$, $[*1]$, $[0b]$, $[*\text{-color}(*)]$,

$[*\text{-color}^*(*)], [*^\text{H}], [*^\text{T}], [*^\text{U}], [*^\text{h}], [*^\text{t}], [*^\text{s}], [*^\text{c}], [*^\text{d}], [*^\text{a}], [*^\text{C}], [*^\text{M}], [*^\text{B}], [*^\text{r}], [*^\text{i}],$
$[*^\text{d}], [*^\text{R}], [*^0], [*^1], [*^2], [*^3], [*^4], [*^5], [*^6], [*^7], [*^8], [*^9], [*^\text{E}], [*^\mathcal{V}], [*^\mathcal{C}], [*^{\mathcal{C}^*}],$
$[*^\text{hide}];$

Preassociative

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

Preassociative

$[* \, ' \, *], [* \, ` \, *];$

Preassociative

$[*'];$

Preassociative

$[* \, ' \, *], [* \, ` \, *];$

Preassociative

$[* \cdot *], [* \cdot_0 *];$

Preassociative

$[* + *], [* +_0 *], [* +_1 *], [* - *], [* -_0 *], [* -_1 *];$

Preassociative

$[* \cup \{*\}], [* \cup *], [*\backslash\{*\}];$

Postassociative

$[* \therefore *], [* \underline{\therefore} *], [* \underline{::} *], [* \underline{+2*} *], [* :: *], [* +2* *];$

Postassociative

$[*, *];$

Preassociative

$[* \overset{\text{B}}{\approx} *], [* \overset{\text{D}}{\approx} *], [* \overset{\text{C}}{\approx} *], [* \overset{\text{P}}{\approx} *], [* \approx *], [* = *], [* \overset{+}{\to} *], [* \overset{\text{t}}{=} *], [* \overset{\text{t}^*}{=} *], [* \overset{\text{r}}{=} *],$
$[* \in_\text{t} *], [* \subseteq_\text{T} *], [* \overset{\text{T}}{=} *], [* \overset{\text{s}}{=} *], [* \text{ free in } *], [* \text{ free in}^* *], [* \text{ free for } * \text{ in } *],$
$[* \text{ free for}^* * \text{ in } *], [* \in_\text{c} *], [* < *], [* <' *], [* \leq' *], [* = *], [* \neq *], [*^\text{var}],$
$[*\#^0*], [*\#^1*], [*\#^**], [* \equiv *], [* = *];$

Preassociative

$[\neg*], [\neg*];$

Preassociative

$[* \wedge *], [* \ddot{\wedge} *], [* \tilde{\wedge} *], [* \wedge_\text{c} *], [* \wedge *];$

Preassociative

$[* \vee *], [* \| *], [* \ddot{\vee} *], [* \vee *];$

Preassociative

$[\exists*\colon *], [\forall*\colon *], [\forall_\text{obj}*\colon *], [\forall * . (*)], [\exists * . (*)];$

Postassociative

$[* \Rightarrow *], [* \Rightarrow *], [* \Leftrightarrow *];$

Postassociative

$[* : *], [* \text{ spy } *], [*!*];$
Preassociative
$[* \left\{ \begin{array}{c} * \\ * \end{array} \right.];$
Preassociative
$[\lambda * . *], [\Lambda * . *], [\Lambda *], [\textbf{if } * \textbf{ then } * \textbf{ else } *], [\textbf{let } * = * \textbf{ in } *], [\textbf{let } * \overset{.}{=} * \text{ in } *];$
Preassociative
$[*\#*];$
Preassociative
$[*^{\text{I}}], [*^{\triangleright}], [*^{\text{V}}], [*^{+}], [*^{-}], [*^{*}];$
Preassociative
$[* @ *], [* \triangleright *], [* \triangleright\!\!\!\triangleright *], [* \gg *], [* \trianglerighteq *];$
Postassociative
$[* \vdash *], [* \Vdash *], [* \text{ i.e. } *];$
Preassociative
$[\forall *: *], [\Pi *: *];$
Postassociative
$[* \oplus *];$
Postassociative
$[*; *];$
Preassociative
$[* \text{ proves } *];$
Preassociative
$[* \textbf{ proof of } * : *], [\text{Line } * : * \gg *; *], [\text{Last line } * \gg * \square],$
$[\text{Line } * : \text{Premise} \gg *; *], [\text{Line } * : \text{Side-condition} \gg *; *], [\text{Arbitrary} \gg *; *],$
$[\text{Local} \gg * = *; *], [\text{Begin } *; * : \text{End}; *], [\text{Last block line } * \gg *;],$
$[\text{Arbitrary} \gg *; *];$
Postassociative
$[* \mid *];$
Postassociative
$[* , *], [*[*]*];$
Preassociative
$[* \& *], [\rightarrow];$
Preassociative
$[* \backslash\backslash *], [* \text{ linebreak}[4] *], [* \backslash\backslash *];$
Preassociative
$[* \in *];]$

$[\text{finalversion} \overset{\text{pyk}}{\rightarrow} \text{"finalversion"}]$

pred calc

$[\text{pred calc} \overset{\text{stmt}}{\rightarrow} \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{g} \vdash \underline{f} \vdash \underline{g} \oplus \forall \underline{f}: \forall \underline{g}: \underline{f} \land \underline{g} \Rightarrow \underline{f} \oplus \forall \underline{f}: \neg\neg \underline{f} \Rightarrow \underline{f} \oplus$
$\forall \underline{f}: \forall \underline{g}: \forall \underline{h}: \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \Rightarrow \underline{h} \oplus \forall \underline{x}: \forall \underline{r}: \forall \underline{g}: \forall \underline{f}: \lceil \underline{x} \rceil \#^0 \lceil \underline{r} \rceil \Vdash \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash$

$\langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil||\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \Vdash \underline{g} \Rightarrow \exists\underline{x}.\,(\underline{f}) \oplus \forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{f} \vee \underline{g} \oplus \forall\underline{f}:\forall\underline{g}:\forall\underline{h}:\underline{f} \Rightarrow \underline{g} \Rightarrow$ $\underline{g} \Rightarrow \underline{f} \vee \underline{h} \Rightarrow \underline{g} \oplus \forall\underline{f}:\forall\underline{g}:\forall\underline{x}:\lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash \underline{f} \Rightarrow \underline{g} \vdash \exists\underline{x}.\,(\underline{f}) \Rightarrow \underline{g} \oplus \forall\underline{f}:\forall\underline{g}:\underline{f} \vdash \underline{f} \Rightarrow$ $\underline{g} \vdash \underline{g} \oplus \forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{g} \vee \underline{f} \oplus \forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \neg\underline{g} \Rightarrow \neg\underline{f} \oplus$ $\forall\underline{a}:\forall\underline{b}:\lambda x.\mathrm{Ded}_0(\lceil\underline{a}\rceil,\lceil\underline{b}\rceil) \Vdash \underline{a} \vdash \underline{b} \oplus \forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \oplus$ $\forall\underline{x}:\forall\underline{r}:\forall\underline{g}:\forall\underline{f}:\lceil\underline{x}\rceil\#^0\lceil\underline{r}\rceil \Vdash \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \oplus \langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil||\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \Vdash \forall\underline{x}.\,(\underline{f}) \Rightarrow \underline{g} \oplus$ $\forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \wedge \underline{g} \oplus \forall\underline{f}:\forall\underline{g}:\underline{f} \wedge \underline{g} \Rightarrow \underline{g} \oplus \forall\underline{f}:\forall\underline{g}:\forall\underline{x}:\lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash \underline{g} \Rightarrow \underline{f} \vdash \underline{g} \Rightarrow$ $\forall\underline{x}.\,(\underline{f})]$

[pred calc $\overset{\mathrm{pyk}}{\to}$ "pred calc"]

pc1

[pc1 $\overset{\mathrm{proof}}{\to}$ Rule tactic]

[pc1 $\overset{\mathrm{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f}$]

[pc1 $\overset{\mathrm{pyk}}{\to}$ "pc1"]

pc2

[pc2 $\overset{\mathrm{proof}}{\to}$ Rule tactic]

[pc2 $\overset{\mathrm{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}:\forall\underline{g}:\forall\underline{h}:\underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \Rightarrow \underline{h}$]

[pc2 $\overset{\mathrm{pyk}}{\to}$ "pc2"]

pc3

[pc3 $\overset{\mathrm{proof}}{\to}$ Rule tactic]

[pc3 $\overset{\mathrm{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \wedge \underline{g}$]

[pc3 $\overset{\mathrm{pyk}}{\to}$ "pc3"]

pc4

[pc4 $\overset{\mathrm{proof}}{\to}$ Rule tactic]

[pc4 $\overset{\mathrm{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}:\forall\underline{g}:\underline{f} \Rightarrow \underline{f} \vee \underline{g}$]

[pc4 $\overset{\mathrm{pyk}}{\to}$ "pc4"]

pc5

[pc5 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc5 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} : \forall \underline{g} : \underline{f} \Rightarrow \underline{g} \vee \underline{f}$]

[pc5 $\overset{\text{pyk}}{\rightarrow}$ "pc5"]

pc6

[pc6 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc6 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} : \forall \underline{g} : \underline{f} \wedge \underline{g} \Rightarrow \underline{f}$]

[pc6 $\overset{\text{pyk}}{\rightarrow}$ "pc6"]

pc7

[pc7 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc7 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} : \forall \underline{g} : \underline{f} \wedge \underline{g} \Rightarrow \underline{g}$]

[pc7 $\overset{\text{pyk}}{\rightarrow}$ "pc7"]

pc8

[pc8 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc8 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} : \forall \underline{g} : \forall \underline{h} : \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{g} \Rightarrow \underline{f} \vee \underline{h} \Rightarrow \underline{g}$]

[pc8 $\overset{\text{pyk}}{\rightarrow}$ "pc8"]

pc9

[pc9 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc9 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} : \forall \underline{g} : \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \neg \underline{g} \Rightarrow \neg \underline{f}$]

[pc9 $\overset{\text{pyk}}{\rightarrow}$ "pc9"]

pc10

[pc10 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc10 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f}: \neg\neg\underline{f} \Rightarrow \underline{f}$]

[pc10 $\overset{\text{pyk}}{\rightarrow}$ "pc10"]

pc11

[pc11 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc11 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{x}: \forall \underline{r}: \forall \underline{g}: \forall \underline{f}: \lceil \underline{x} \rceil \#^0 \lceil \underline{r} \rceil \Vdash \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \langle \lceil \underline{g} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{r} \rceil \rangle \Vdash \forall \underline{x}. (\underline{f}) \Rightarrow \underline{g}$]

[pc11 $\overset{\text{pyk}}{\rightarrow}$ "pc11"]

pc12

[pc12 $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pc12 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{x}: \forall \underline{r}: \forall \underline{g}: \forall \underline{f}: \lceil \underline{x} \rceil \#^0 \lceil \underline{r} \rceil \Vdash \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \langle \lceil \underline{g} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{r} \rceil \rangle \Vdash \underline{g} \Rightarrow \exists \underline{x}. (\underline{f})$]

[pc12 $\overset{\text{pyk}}{\rightarrow}$ "pc12"]

pcmp

[pcmp $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pcmp $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{f} \Rightarrow \underline{g} \vdash \underline{g}$]

[pcmp $\overset{\text{pyk}}{\rightarrow}$ "pcmp"]

pcunsound

[pcunsound $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pcunsound $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{g} \vdash \underline{f} \vdash \underline{g}$]

[pcunsound $\overset{\text{pyk}}{\rightarrow}$ "pcunsound"]

pcia

[pcia $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pcia $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} \colon \forall \underline{g} \colon \forall \underline{x} \colon \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \underline{g} \Rightarrow \underline{f} \vdash \underline{g} \Rightarrow \forall \underline{x}. (\underline{f})$]

[pcia $\overset{\text{pyk}}{\rightarrow}$ "pcia"]

pcie

[pcie $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pcie $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} \colon \forall \underline{g} \colon \forall \underline{x} \colon \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \underline{f} \Rightarrow \underline{g} \vdash \exists \underline{x}. (\underline{f}) \Rightarrow \underline{g}$]

[pcie $\overset{\text{pyk}}{\rightarrow}$ "pcie"]

pcdeduction

[pcdeduction $\overset{\text{proof}}{\rightarrow}$ Rule tactic]

[pcdeduction $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{a} \colon \forall \underline{b} \colon \lambda x. \mathrm{Ded}_0(\lceil \underline{a} \rceil, \lceil \underline{b} \rceil) \Vdash \underline{a} \vdash \underline{b}$]

[pcdeduction $\overset{\text{pyk}}{\rightarrow}$ "pcdeduction"]

trivia

[trivia $\overset{\text{proof}}{\rightarrow} \lambda\mathsf{c}.\lambda\mathsf{x}.\mathcal{P}(\lceil$pred calc $\vdash \forall \underline{f} \colon \mathrm{pc2} \gg \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f}; \mathrm{pc1} \gg \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f}; \mathrm{pcmp} \rhd \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \rhd \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \gg \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f}; \mathrm{pc1} \gg \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f}; \mathrm{pcmp} \rhd \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \rhd \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \Rightarrow \underline{f} \gg \underline{f} \Rightarrow \underline{f} \rceil, p_0, \mathsf{c})$]

[trivia $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} \colon \underline{f} \Rightarrow \underline{f}$]

[trivia $\overset{\text{pyk}}{\rightarrow}$ "trivia"]

repeat

[repeat $\overset{\text{proof}}{\rightarrow} \lambda\mathsf{c}.\lambda\mathsf{x}.\mathcal{P}(\lceil$pred calc $\vdash \forall \underline{f} \colon \underline{f} \vdash \mathrm{trivia} \gg \underline{f} \Rightarrow \underline{f}; \mathrm{pcmp} \rhd \underline{f} \rhd \underline{f} \Rightarrow \underline{f} \gg \underline{f} \rceil, p_0, \mathsf{c})$]

[repeat $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall \underline{f} \colon \underline{f} \vdash \underline{f}$]

[repeat $\overset{\text{pyk}}{\rightarrow}$ "repeat"]

andintro

[andintro $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}$ $\vdash$ $\underline{g}$ $\vdash$ pc3 $\gg$ $\underline{f}$ $\Rightarrow$ $\underline{g}$ $\Rightarrow$
$\underline{f}\wedge\underline{g}$; pcmp $\triangleright$ $\underline{f}$ $\triangleright$ $\underline{f}$ $\Rightarrow$ $\underline{g}$ $\Rightarrow$ $\underline{f}\wedge\underline{g}$ $\gg$ $\underline{g}$ $\Rightarrow$ $\underline{f}\wedge\underline{g}$; pcmp $\triangleright$ $\underline{g}$ $\triangleright$ $\underline{g}$ $\Rightarrow$ $\underline{f}\wedge\underline{g}$ $\gg$ $\underline{f}\wedge\underline{g}\rceil$, p_0, c)]

[andintro $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}$ $\vdash$ $\underline{g}$ $\vdash$ $\underline{f}\wedge\underline{g}$]

[andintro $\overset{\text{pyk}}{\rightarrow}$ "andintro"]

andelim1

[andelim1 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}\wedge\underline{g}$ $\vdash$ pc6 $\gg$ $\underline{f}\wedge\underline{g}$ $\Rightarrow$
$\underline{f}$; pcmp $\triangleright$ $\underline{f}\wedge\underline{g}$ $\triangleright$ $\underline{f}\wedge\underline{g}$ $\Rightarrow$ $\underline{f}$ $\gg$ $\underline{f}\rceil$, p_0, c)]

[andelim1 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}\wedge\underline{g}$ $\vdash$ $\underline{f}$]

[andelim1 $\overset{\text{pyk}}{\rightarrow}$ "andelim1"]

andelim2

[andelim2 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}\wedge\underline{g}$ $\vdash$ pc7 $\gg$ $\underline{f}\wedge\underline{g}$ $\Rightarrow$
$\underline{g}$; pcmp $\triangleright$ $\underline{f}\wedge\underline{g}$ $\triangleright$ $\underline{f}\wedge\underline{g}$ $\Rightarrow$ $\underline{g}$ $\gg$ $\underline{g}\rceil$, p_0, c)]

[andelim2 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}\wedge\underline{g}$ $\vdash$ $\underline{g}$]

[andelim2 $\overset{\text{pyk}}{\rightarrow}$ "andelim2"]

orintro1

[orintro1 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}$ $\vdash$ pc4 $\gg$ $\underline{f}$ $\Rightarrow$ $\underline{f}\vee\underline{g}$; pcmp $\triangleright$ $\underline{f}$ $\triangleright$ $\underline{f}$ $\Rightarrow$
$\underline{f}\vee\underline{g}$ $\gg$ $\underline{f}\vee\underline{g}\rceil$, p_0, c)]

[orintro1 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f}$ $\vdash$ $\underline{f}\vee\underline{g}$]

[orintro1 $\overset{\text{pyk}}{\rightarrow}$ "orintro1"]

orintro2

[orintro2 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{g}$ $\vdash$ pc5 $\gg$ $\underline{g}$ $\Rightarrow$
$\underline{f}\vee\underline{g}$; pcmp $\triangleright$ $\underline{g}$ $\triangleright$ $\underline{g}$ $\Rightarrow$ $\underline{f}\vee\underline{g}$ $\gg$ $\underline{f}\vee\underline{g}\rceil$, p_0, c)]

[orintro2 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{g}$ $\vdash$ $\underline{f}\vee\underline{g}$]

[orintro2 $\overset{\text{pyk}}{\to}$ "orintro2"]

orelim

[orelim $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \forall\underline{h}: \underline{f} \vee \underline{g} \vdash \underline{f} \vdash \underline{h} \vdash \underline{g} \vdash \underline{h} \vdash$ implyintro $\triangleright$ $\underline{f} \vdash \underline{h} \gg \underline{f} \Rightarrow \underline{h}$; implyintro $\triangleright \underline{g} \vdash \underline{h} \gg \underline{g} \Rightarrow \underline{h}$; pc8 $\gg \underline{f} \Rightarrow \underline{h} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \vee \underline{g} \Rightarrow$ $\underline{h}$; pcmp$\triangleright\underline{f} \Rightarrow \underline{h}\triangleright\underline{f} \Rightarrow \underline{h} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f}\vee\underline{g} \Rightarrow \underline{h} \gg \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f}\vee\underline{g} \Rightarrow \underline{h}$; pcmp$\triangleright\underline{g} \Rightarrow$ $\underline{h} \triangleright \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \vee \underline{g} \Rightarrow \underline{h} \gg \underline{f} \vee \underline{g} \Rightarrow \underline{h}$; pcmp $\triangleright \underline{f} \vee \underline{g} \triangleright \underline{f} \vee \underline{g} \Rightarrow \underline{h} \gg \underline{h}\rceil$, p$_0$, c)]

[orelim $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \forall\underline{h}: \underline{f} \vee \underline{g} \vdash \underline{f} \vdash \underline{h} \vdash \underline{g} \vdash \underline{h} \vdash \underline{h}$]

[orelim $\overset{\text{pyk}}{\to}$ "orelim"]

notintro

[notintro $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash \underline{g} \vdash \underline{f} \vdash \neg\underline{g} \vdash$ implyintro $\triangleright \underline{f} \vdash$ $\underline{g} \gg \underline{f} \Rightarrow \underline{g}$; implyintro $\triangleright \underline{f} \vdash \neg\underline{g} \gg \underline{f} \Rightarrow \neg\underline{g}$; pc9 $\gg \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \neg\underline{g} \Rightarrow$ $\neg\underline{f}$; pcmp $\triangleright \underline{f} \Rightarrow \underline{g} \triangleright \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \neg\underline{g} \Rightarrow \neg\underline{f} \gg \underline{f} \Rightarrow \neg\underline{g} \Rightarrow \neg\underline{f}$; pcmp $\triangleright \underline{f} \Rightarrow$ $\neg\underline{g} \triangleright \underline{f} \Rightarrow \neg\underline{g} \Rightarrow \neg\underline{f} \gg \neg\underline{f}\rceil$, p$_0$, c)]

[notintro $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash \underline{g} \vdash \underline{f} \vdash \neg\underline{g} \vdash \neg\underline{f}$]

[notintro $\overset{\text{pyk}}{\to}$ "notintro"]

implyintro

[implyintro $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash \underline{g} \vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash$ pcunsound $\triangleright \underline{f} \vdash$ $\underline{g} \triangleright \underline{f} \gg \underline{g}$; pcdeduction $\triangleright \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash \underline{g} \gg \underline{f} \Rightarrow \underline{g}\rceil$, p$_0$, c)]

[implyintro $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash \underline{g} \vdash \underline{f} \Rightarrow \underline{g}$]

[implyintro $\overset{\text{pyk}}{\to}$ "implyintro"]

notnotintro

[notnotintro $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash \forall\underline{f}: \underline{f} \vdash \forall\underline{f}: \underline{f} \vdash \neg\underline{f} \vdash$ repeat $\triangleright \underline{f} \gg$ $\underline{f}$; pcdeduction $\triangleright \forall\underline{f}: \underline{f} \vdash \neg\underline{f} \vdash \underline{f} \gg \underline{f} \Rightarrow \neg\underline{f} \Rightarrow \underline{f}$; pcmp $\triangleright \underline{f} \triangleright \underline{f} \Rightarrow \neg\underline{f} \Rightarrow \underline{f} \gg \neg\underline{f} \Rightarrow$ $\underline{f}$; trivia $\gg \neg\underline{f} \Rightarrow \neg\underline{f}$; pc9 $\gg \neg\underline{f} \Rightarrow \underline{f} \Rightarrow \neg\underline{f} \Rightarrow \neg\underline{f} \Rightarrow \neg\neg\underline{f}$; pcmp $\triangleright \neg\underline{f} \Rightarrow \underline{f} \triangleright \neg\underline{f} \Rightarrow$ $\underline{f} \Rightarrow \neg\underline{f} \Rightarrow \neg\underline{f} \Rightarrow \neg\neg\underline{f} \gg \neg\underline{f} \Rightarrow \neg\underline{f} \Rightarrow \neg\neg\underline{f}$; pcmp $\triangleright \neg\underline{f} \Rightarrow \neg\underline{f} \triangleright \neg\underline{f} \Rightarrow \neg\underline{f} \Rightarrow \neg\neg\underline{f} \gg$ $\neg\neg\underline{f}\rceil$, p$_0$, c)]

[notnotintro $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}: \underline{f} \vdash \neg\neg\underline{f}$]

[notnotintro $\overset{\text{pyk}}{\rightarrow}$ "notnotintro"]

notnotelim

[notnotelim $\overset{\text{proof}}{\rightarrow}$ $\lambda\mathsf{c}.\lambda\mathsf{x}.\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{f}: \neg\neg\underline{f} \vdash$ pc10 $\gg \neg\neg\underline{f} \Rightarrow$
$\underline{f}$; pcmp $\triangleright \neg\neg\underline{f} \triangleright \neg\neg\underline{f} \Rightarrow \underline{f} \gg \underline{f}\rceil, p_0, \mathsf{c})$]

[notnotelim $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall\underline{f}: \neg\neg\underline{f} \vdash \underline{f}$]

[notnotelim $\overset{\text{pyk}}{\rightarrow}$ "notnotelim"]

mt

[mt $\overset{\text{proof}}{\rightarrow}$ $\lambda\mathsf{c}.\lambda\mathsf{x}.\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \Rightarrow \underline{g} \vdash \neg\underline{g} \vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash$ pcmp $\triangleright \underline{f} \triangleright \underline{f} \Rightarrow$
$\underline{g} \gg \underline{g}$; pcdeduction $\triangleright \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash \underline{g} \gg \underline{f} \vdash \underline{g}; \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash$ repeat $\triangleright \neg\underline{g} \gg$
$\neg\underline{g}$; pcdeduction $\triangleright \forall\underline{f}: \forall\underline{g}: \underline{f} \vdash \neg\underline{g} \gg \underline{f} \vdash \neg\underline{g}$; notintro $\triangleright \underline{f} \vdash \underline{g} \triangleright \underline{f} \vdash \neg\underline{g} \gg \neg\underline{f}\rceil, p_0, \mathsf{c})$]

[mt $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \underline{f} \Rightarrow \underline{g} \vdash \neg\underline{g} \vdash \neg\underline{f}$]

[mt $\overset{\text{pyk}}{\rightarrow}$ "mt"]

pbc

[pbc $\overset{\text{proof}}{\rightarrow}$ $\lambda\mathsf{c}.\lambda\mathsf{x}.\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \neg\underline{f} \vdash \underline{g} \vdash \neg\underline{f} \vdash \neg\underline{g} \vdash$ notintro $\triangleright \neg\underline{f} \vdash$
$\underline{g} \triangleright \neg\underline{f} \vdash \neg\underline{g} \gg \neg\neg\underline{f}$; notnotelim $\triangleright \neg\neg\underline{f} \gg \underline{f}\rceil, p_0, \mathsf{c})$]

[pbc $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \neg\underline{f} \vdash \underline{g} \vdash \neg\underline{f} \vdash \neg\underline{g} \vdash \underline{f}$]

[pbc $\overset{\text{pyk}}{\rightarrow}$ "pbc"]

lem

[lem $\overset{\text{proof}}{\rightarrow}$ $\lambda\mathsf{c}.\lambda\mathsf{x}.\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{f}: \forall\underline{f}: \neg\underline{f} \vee \neg\underline{f} \vdash \forall\underline{f}: \underline{f} \vdash$ orintro1 $\triangleright \underline{f} \gg$
$\underline{f} \vee \neg\underline{f}$; pcdeduction $\triangleright \forall\underline{f}: \underline{f} \vdash \underline{f} \vee \neg\underline{f} \gg \underline{f} \vdash \underline{f} \vee \neg\underline{f}; \forall\underline{f}: \underline{f} \vdash$ repeat $\triangleright \neg\underline{f} \vee \neg\underline{f} \gg$
$\neg\underline{f} \vee \neg\underline{f}$; pcdeduction $\triangleright \forall\underline{f}: \underline{f} \vdash \neg\underline{f} \vee \neg\underline{f} \gg \underline{f} \vdash \neg\underline{f} \vee \neg\underline{f}$; notintro $\triangleright \underline{f} \vdash \underline{f} \vee \neg\underline{f} \triangleright \underline{f} \vdash$
$\neg\underline{f} \vee \neg\underline{f} \gg \neg\underline{f}$; orintro2 $\triangleright \neg\underline{f} \gg \underline{f} \vee \neg\underline{f}$; pcdeduction $\triangleright \forall\underline{f}: \neg\underline{f} \vee \neg\underline{f} \vdash \underline{f} \vee \neg\underline{f} \gg \neg\underline{f} \vee \neg\underline{f} \vdash$
$\underline{f} \vee \neg\underline{f}; \forall\underline{f}: \neg\underline{f} \vee \neg\underline{f} \vdash$ repeat $\triangleright \neg\underline{f} \vee \neg\underline{f} \gg \neg\underline{f} \vee \neg\underline{f}$; pcdeduction $\triangleright \forall\underline{f}: \neg\underline{f} \vee \neg\underline{f} \vdash$
$\neg\underline{f} \vee \neg\underline{f} \gg \neg\underline{f} \vee \neg\underline{f} \vdash \neg\underline{f} \vee \neg\underline{f}$; notintro $\triangleright \neg\underline{f} \vee \neg\underline{f} \vdash \underline{f} \vee \neg\underline{f} \triangleright \neg\underline{f} \vee \neg\underline{f} \vdash \neg\underline{f} \vee \neg\underline{f} \gg$
$\neg\neg\underline{f} \vee \neg\underline{f}$; notnotelim $\triangleright \neg\neg\underline{f} \vee \neg\underline{f} \gg \underline{f} \vee \neg\underline{f}\rceil, p_0, \mathsf{c})$]

[lem $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash \forall\underline{f}: \underline{f} \vee \neg\underline{f}$]

[lem $\overset{\text{pyk}}{\rightarrow}$ "lem"]

forallintro

[forallintro $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \forall\underline{x}: \lceil\underline{x}\rceil\#^0\lceil\underline{g} \vee \neg\underline{g}\rceil \Vdash \underline{f} \vdash$ lem $\gg$
$\underline{g} \vee \neg\underline{g}; \forall\underline{g}: \forall\underline{f}: \underline{g} \vee \neg\underline{g} \vdash$ repeat $\rhd \underline{f} \gg \underline{f}$; pcdeduction $\rhd \forall\underline{g}: \forall\underline{f}: \underline{g} \vee \neg\underline{g} \vdash \underline{f} \gg$
$\underline{g} \vee \neg\underline{g} \Rightarrow \underline{f}$; pcia $\rhd \lceil\underline{x}\rceil\#^0\lceil\underline{g} \vee \neg\underline{g}\rceil \rhd \underline{g} \vee \neg\underline{g} \Rightarrow \underline{f} \gg \underline{g} \vee \neg\underline{g} \Rightarrow$
$\forall\underline{x}. (\underline{f})$; pcmp $\rhd \underline{g} \vee \neg\underline{g} \rhd \underline{g} \vee \neg\underline{g} \Rightarrow \forall\underline{x}. (\underline{f}) \gg \forall\underline{x}. (\underline{f})\rceil, p_0, c)]$

[forallintro $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{f}: \forall\underline{g}: \forall\underline{x}: \lceil\underline{x}\rceil\#^0\lceil\underline{g} \vee \neg\underline{g}\rceil \Vdash \underline{f} \vdash \forall\underline{x}. (\underline{f})]$

[forallintro $\overset{\text{pyk}}{\to}$ "forallintro"]

forallelim

[forallelim $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{x}: \forall\underline{r}: \forall\underline{g}: \forall\underline{f}: \lceil\underline{x}\rceil\#^0\lceil\underline{r}\rceil \Vdash \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash$
$\langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil|\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \Vdash$ pc11 $\rhd \lceil\underline{x}\rceil\#^0\lceil\underline{r}\rceil \rhd \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \rhd \langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil|\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \gg$
$\forall\underline{x}. (\underline{f}) \Rightarrow \underline{g}; \forall\underline{x}: \forall\underline{g}: \forall\underline{f}: \forall\underline{x}. (\underline{f}) \vdash$ pcmp $\rhd \forall\underline{x}. (\underline{f}) \rhd \forall\underline{x}. (\underline{f}) \Rightarrow \underline{g} \gg$
$\underline{g}$; pcdeduction $\rhd \forall\underline{x}: \forall\underline{g}: \forall\underline{f}: \forall\underline{x}. (\underline{f}) \vdash \underline{g} \gg \forall\underline{x}. (\underline{f}) \vdash \underline{g}\rceil, p_0, c)]$

[forallelim $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{x}: \forall\underline{r}: \forall\underline{g}: \forall\underline{f}: \lceil\underline{x}\rceil\#^0\lceil\underline{r}\rceil \Vdash \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash$
$\langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil|\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \Vdash \forall\underline{x}. (\underline{f}) \vdash \underline{g}]$

[forallelim $\overset{\text{pyk}}{\to}$ "forallelim"]

existsintro

[existsintro $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{x}: \forall\underline{r}: \forall\underline{g}: \forall\underline{f}: \lceil\underline{x}\rceil\#^0\lceil\underline{r}\rceil \Vdash \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash$
$\langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil|\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \Vdash$ pc12 $\rhd \lceil\underline{x}\rceil\#^0\lceil\underline{r}\rceil \rhd \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \rhd \langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil|\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \gg$
$\underline{g} \Rightarrow \exists\underline{x}. (\underline{f}); \forall\underline{x}: \forall\underline{g}: \forall\underline{f}: \underline{g} \vdash$ pcmp $\rhd \underline{g} \rhd \underline{g} \Rightarrow \exists\underline{x}. (\underline{f}) \gg$
$\exists\underline{x}. (\underline{f})$; pcdeduction $\rhd \forall\underline{x}: \forall\underline{g}: \forall\underline{f}: \underline{g} \vdash \exists\underline{x}. (\underline{f}) \gg \underline{g} \vdash \exists\underline{x}. (\underline{f})\rceil, p_0, c)]$

[existsintro $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{x}: \forall\underline{r}: \forall\underline{g}: \forall\underline{f}: \lceil\underline{x}\rceil\#^0\lceil\underline{r}\rceil \Vdash \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash$
$\langle\lceil\underline{g}\rceil\equiv^0\lceil\underline{f}\rceil|\lceil\underline{x}\rceil:=\lceil\underline{r}\rceil\rangle \Vdash \underline{g} \vdash \exists\underline{x}. (\underline{f})]$

[existsintro $\overset{\text{pyk}}{\to}$ "existsintro"]

existselim

[existselim $\overset{\text{proof}}{\to}$ λc.λx.$\mathcal{P}(\lceil$pred calc $\vdash \forall\underline{x}: \forall\underline{f}: \forall\underline{g}: \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash \exists\underline{x}. (\underline{f}) \vdash \underline{f} \vdash \underline{g} \vdash$
implyintro $\rhd \underline{f} \vdash \underline{g} \gg \underline{f} \Rightarrow \underline{g}$; pcie $\rhd \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \rhd \underline{f} \Rightarrow \underline{g} \gg \exists\underline{x}. (\underline{f}) \Rightarrow$
$\underline{g}$; pcmp $\rhd \exists\underline{x}. (\underline{f}) \rhd \exists\underline{x}. (\underline{f}) \Rightarrow \underline{g} \gg \underline{g}\rceil, p_0, c)]$

[existselim $\overset{\text{stmt}}{\to}$ pred calc $\vdash \forall\underline{x}: \forall\underline{f}: \forall\underline{g}: \lceil\underline{x}\rceil\#^0\lceil\underline{g}\rceil \Vdash \exists\underline{x}. (\underline{f}) \vdash \underline{f} \vdash \underline{g} \vdash \underline{g}]$

[existselim $\overset{\text{pyk}}{\mapsto}$ "existselim"]

bottomelim

[bottomelim $\overset{\text{proof}}{\mapsto}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \wedge \neg\underline{f} \vdash \forall\underline{f}$: $\forall\underline{g}$: $\neg\underline{g} \vdash$
andelim1 $\triangleright$ $\underline{f} \wedge \neg\underline{f} \gg \underline{f}$; pcdeduction $\triangleright$ $\forall\underline{f}$: $\forall\underline{g}$: $\neg\underline{g} \vdash \underline{f} \gg \neg\underline{g} \vdash \underline{f}$; $\forall\underline{f}$: $\forall\underline{g}$: $\neg\underline{g} \vdash$
andelim2 $\triangleright$ $\underline{f} \wedge \neg\underline{f} \gg \neg\underline{f}$; pcdeduction $\triangleright$ $\forall\underline{f}$: $\forall\underline{g}$: $\neg\underline{g} \vdash \neg\underline{f} \gg \neg\underline{g} \vdash$
$\neg\underline{f}$; notintro $\triangleright$ $\neg\underline{g} \vdash \underline{f} \triangleright \neg\underline{g} \vdash \neg\underline{f} \gg \neg\neg\underline{g}$; notnotelim $\triangleright$ $\neg\neg\underline{g} \gg \underline{g}\rceil$, p$_0$, c)]

[bottomelim $\overset{\text{stmt}}{\mapsto}$ pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \wedge \neg\underline{f} \vdash \underline{g}$]

[bottomelim $\overset{\text{pyk}}{\mapsto}$ "bottomelim"]

lemnotintro

[lemnotintro $\overset{\text{proof}}{\mapsto}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \Rightarrow \underline{g} \wedge \neg\underline{g} \vdash \forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \vdash$
pcmp $\triangleright$ $\underline{f} \triangleright \underline{f} \Rightarrow \underline{g} \wedge \neg\underline{g} \gg \underline{g} \wedge \neg\underline{g}$; andelim1 $\triangleright$ $\underline{g} \wedge \neg\underline{g} \gg \underline{g}$; pcdeduction $\triangleright$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \vdash$
$\underline{g} \gg \underline{f} \vdash \underline{g}$; $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \vdash$ pcmp $\triangleright$ $\underline{f} \triangleright \underline{f} \Rightarrow \underline{g} \wedge \neg\underline{g} \gg \underline{g} \wedge \neg\underline{g}$; andelim2 $\triangleright$ $\underline{g} \wedge \neg\underline{g} \gg$
$\neg\underline{g}$; pcdeduction $\triangleright$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \vdash \neg\underline{g} \gg \underline{f} \vdash \neg\underline{g}$; notintro $\triangleright$ $\overline{\underline{f} \vdash \underline{g}} \triangleright \underline{f} \vdash \neg\underline{g} \gg \neg\underline{f}\rceil$, p$_0$, c)]

[lemnotintro $\overset{\text{stmt}}{\mapsto}$ pred calc $\vdash$ $\forall\underline{f}$: $\forall\underline{g}$: $\underline{f} \Rightarrow \underline{g} \wedge \neg\underline{g} \vdash \neg\underline{f}$]

[lemnotintro $\overset{\text{pyk}}{\mapsto}$ "lemnotintro"]

hlplem1

[hlplem1 $\overset{\text{proof}}{\mapsto}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \vdash$
pcmp $\triangleright$ $\underline{p} \Rightarrow \underline{q} \triangleright \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \gg \underline{q}$; pcmp $\triangleright$ $\underline{q} \triangleright \underline{q} \Rightarrow \underline{p} \gg \underline{p}\rceil$, p$_0$, c)]

[hlplem1 $\overset{\text{stmt}}{\mapsto}$ pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \vdash \underline{p}$]

[hlplem1 $\overset{\text{pyk}}{\mapsto}$ "hlplem1"]

hlplem2

[hlplem2 $\overset{\text{proof}}{\mapsto}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \vdash \neg\underline{p} \vdash$ andintro $\triangleright$ $\underline{p} \triangleright \neg\underline{p} \gg$
$\underline{p} \wedge \neg\underline{p}$; bottomelim $\triangleright$ $\underline{p} \wedge \neg\underline{p} \gg \underline{q}\rceil$, p$_0$, c)]

[hlplem2 $\overset{\text{stmt}}{\mapsto}$ pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \vdash \neg\underline{p} \vdash \underline{q}$]

[hlplem2 $\overset{\text{pyk}}{\mapsto}$ "hlplem2"]

hlplem3

[hlplem3 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \Rightarrow \underline{q} \vdash \neg\underline{p} \vdash \forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \vdash$ hlplem2 $\triangleright$ $\underline{p}$ $\triangleright$ $\neg\underline{p} \gg \underline{q}$; pcdeduction $\triangleright$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \vdash \underline{q} \gg \underline{p} \Rightarrow \underline{q}$; andintro $\triangleright$ $\underline{p} \Rightarrow \underline{q} \triangleright \neg\underline{p} \Rightarrow \underline{q} \gg \underline{p} \Rightarrow \underline{q} \wedge \neg\underline{p} \Rightarrow \underline{q}\rceil$, p_0, c)]

[hlplem3 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \Rightarrow \underline{q} \vdash \neg\underline{p} \vdash \underline{p} \Rightarrow \underline{q} \wedge \neg\underline{p} \Rightarrow \underline{q}$]

[hlplem3 $\overset{\text{pyk}}{\rightarrow}$ "hlplem3"]

hlplem4

[hlplem4 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \Rightarrow \underline{q} \vdash \forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \vdash$ hlplem3 $\triangleright \neg\underline{p} \Rightarrow \underline{q} \triangleright \neg\underline{p} \gg \underline{p} \Rightarrow \underline{q} \wedge \neg\underline{p} \Rightarrow \underline{q}$; pcdeduction $\triangleright$ $\forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \vdash \underline{p} \Rightarrow \underline{q} \wedge \neg\underline{p} \Rightarrow \underline{q} \gg \neg\underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \wedge \neg\underline{p} \Rightarrow \underline{q}$; lemnotintro $\triangleright \neg\underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \wedge \neg\underline{p} \Rightarrow \underline{q} \gg \neg\neg\underline{p}$; notnotelim $\triangleright \neg\neg\underline{p} \gg \underline{p}\rceil$, p_0, c)]

[hlplem4 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \Rightarrow \underline{q} \vdash \underline{p}$]

[hlplem4 $\overset{\text{pyk}}{\rightarrow}$ "hlplem4"]

hlplem5

[hlplem5 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \vdash$ hlplem1 $\triangleright$ $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \triangleright \underline{q} \Rightarrow \underline{p} \triangleright \underline{p} \Rightarrow \underline{q} \gg$ $\underline{p}$; pcdeduction $\triangleright$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \vdash \underline{p} \gg \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{p}$; pcmp $\triangleright$ $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \triangleright \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{p} \gg$ $\underline{q} \Rightarrow \underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{p}$; pcmp $\triangleright$ $\underline{q} \Rightarrow \underline{p} \triangleright \underline{q} \Rightarrow \underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{p} \gg \underline{p} \Rightarrow \underline{q} \Rightarrow$ $\underline{p}$; $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \vdash$ pcmp $\triangleright \underline{p} \Rightarrow \underline{q} \triangleright \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{p} \gg \underline{p}$; pcdeduction $\triangleright$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow$ $\underline{q} \vdash \underline{p} \gg \underline{p} \Rightarrow \underline{q} \vdash \underline{p}$; $\forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \Rightarrow \underline{q} \vdash$ hlplem4 $\triangleright \neg\underline{p} \Rightarrow \underline{q} \gg$ $\underline{p}$; pcdeduction $\triangleright$ $\forall\underline{p}$: $\forall\underline{q}$: $\neg\underline{p} \Rightarrow \underline{q} \vdash \underline{p} \gg \neg\underline{p} \Rightarrow \underline{q} \vdash \underline{p}$; lem $\gg \underline{p} \Rightarrow \underline{q} \vee \neg\underline{p} \Rightarrow$ $\underline{q}$; orelim $\triangleright \underline{p} \Rightarrow \underline{q} \vee \neg\underline{p} \Rightarrow \underline{q} \triangleright \underline{p} \Rightarrow \underline{q} \vdash \underline{p} \triangleright \neg\underline{p} \Rightarrow \underline{q} \vdash \underline{p} \gg \underline{p}\rceil$, p_0, c)]

[hlplem5 $\overset{\text{stmt}}{\rightarrow}$ pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p}$]

[hlplem5 $\overset{\text{pyk}}{\rightarrow}$ "hlplem5"]

goal1

[goal1 $\overset{\text{proof}}{\rightarrow}$ λc.λx.$\mathcal{P}$($\lceil$pred calc $\vdash$ $\forall\underline{p}$: $\forall\underline{q}$: $\forall\underline{p}$: $\forall\underline{q}$: $\underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \forall\underline{p}$: $\forall\underline{q}$: $\underline{q} \Rightarrow \underline{p} \vdash$ hlplem5 $\triangleright \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \triangleright \underline{q} \Rightarrow \underline{p} \gg \underline{p}$; pcdeduction $\triangleright$ $\forall\underline{p}$: $\forall\underline{q}$: $\underline{q} \Rightarrow \underline{p} \vdash \underline{p} \gg \underline{q} \Rightarrow$

$\underline{p} \Rightarrow \underline{p}$; pcdeduction $\triangleright \forall \underline{p} \colon \forall \underline{q} \colon \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \Rightarrow \underline{p} \gg \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{p} \Rightarrow \underline{p}], p_0, \mathsf{c})]$

$[\text{goal1} \overset{\text{stmt}}{\to} \text{pred calc} \vdash \forall \underline{p} \colon \forall \underline{q} \colon \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{q} \Rightarrow \underline{p} \Rightarrow \underline{p}]$

$[\text{goal1} \overset{\text{pyk}}{\to} \text{“goal1”}]$

hlplem6

$[\text{hlplem6} \overset{\text{proof}}{\to} \lambda \mathsf{c}.\lambda \mathsf{x}.\mathcal{P}(\lceil \text{pred calc} \vdash \forall \underline{x} \colon \forall \underline{f} \colon \forall \underline{g} \colon \forall \underline{h} \colon \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \lceil \underline{x} \rceil \#^0 \lceil \underline{h} \rceil \Vdash$
$\langle \lceil \underline{h} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{g} \rceil \rangle \Vdash \forall \underline{x}. \, (\underline{f}) \vdash \text{forallelim} \rhd \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \rhd \lceil \underline{x} \rceil \#^0 \lceil \underline{h} \rceil \rhd$
$\langle \lceil \underline{h} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{g} \rceil \rangle \rhd \forall \underline{x}. \, (\underline{f}) \gg \underline{h}; \text{existsintro} \rhd \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \rhd \lceil \underline{x} \rceil \#^0 \lceil \underline{h} \rceil \rhd$
$\langle \lceil \underline{h} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{g} \rceil \rangle \rhd \underline{h} \gg \exists \underline{x}. \, (\underline{f}) \rceil, p_0, \mathsf{c})]$

$[\text{hlplem6} \overset{\text{stmt}}{\to} \text{pred calc} \vdash \forall \underline{x} \colon \forall \underline{f} \colon \forall \underline{g} \colon \forall \underline{h} \colon \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \lceil \underline{x} \rceil \#^0 \lceil \underline{h} \rceil \Vdash$
$\langle \lceil \underline{h} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{g} \rceil \rangle \Vdash \forall \underline{x}. \, (\underline{f}) \vdash \exists \underline{x}. \, (\underline{f})]$

$[\text{hlplem6} \overset{\text{pyk}}{\to} \text{“hlplem6”}]$

goal2

$[\text{goal2} \overset{\text{proof}}{\to} \lambda \mathsf{c}.\lambda \mathsf{x}.\mathcal{P}(\lceil \text{pred calc} \vdash \forall \underline{f} \colon \forall \underline{g} \colon \forall \underline{x} \colon \forall \underline{h} \colon \forall \underline{k} \colon \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \lceil \underline{x} \rceil \#^0 \lceil \underline{h} \rceil \Vdash$
$\langle \lceil \underline{h} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{g} \rceil \rangle \Vdash \forall \underline{x}. \, (\underline{f}) \vdash \text{hlplem6} \rhd \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \rhd \lceil \underline{x} \rceil \#^0 \lceil \underline{h} \rceil \rhd$
$\langle \lceil \underline{h} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{g} \rceil \rangle \rhd \forall \underline{x}. \, (\underline{f}) \gg \exists \underline{x}. \, (\underline{f}) \, ; \forall \underline{f} \colon \forall \underline{x} \colon \forall \underline{k} \colon \exists \underline{x}. \, (\underline{f}) \vdash \neg \exists \underline{x}. \, (\underline{f}) \vdash$
andintro $\rhd \exists \underline{x}. \, (\underline{f}) \rhd \neg \exists \underline{x}. \, (\underline{f}) \gg \exists \underline{x}. \, (\underline{f}) \wedge \neg \exists \underline{x}. \, (\underline{f}) \, ; \text{bottomelim} \rhd \exists \underline{x}. \, (\underline{f}) \wedge \neg \exists \underline{x}. \, (\underline{f}) \gg$
$\underline{k}; \text{pcdeduction} \rhd \forall \underline{f} \colon \forall \underline{x} \colon \forall \underline{k} \colon \exists \underline{x}. \, (\underline{f}) \vdash \neg \exists \underline{x}. \, (\underline{f}) \vdash \underline{k} \gg \exists \underline{x}. \, (\underline{f}) \Rightarrow \neg \exists \underline{x}. \, (\underline{f}) \Rightarrow$
$\underline{k}; \text{pcmp} \rhd \exists \underline{x}. \, (\underline{f}) \rhd \exists \underline{x}. \, (\underline{f}) \Rightarrow \neg \exists \underline{x}. \, (\underline{f}) \Rightarrow \underline{k} \gg \neg \exists \underline{x}. \, (\underline{f}) \Rightarrow \underline{k} \rceil, p_0, \mathsf{c})]$

$[\text{goal2} \overset{\text{stmt}}{\to} \text{pred calc} \vdash \forall \underline{f} \colon \forall \underline{g} \colon \forall \underline{x} \colon \forall \underline{h} \colon \forall \underline{k} \colon \lceil \underline{x} \rceil \#^0 \lceil \underline{g} \rceil \Vdash \lceil \underline{x} \rceil \#^0 \lceil \underline{h} \rceil \Vdash$
$\langle \lceil \underline{h} \rceil \equiv^0 \lceil \underline{f} \rceil | \lceil \underline{x} \rceil := \lceil \underline{g} \rceil \rangle \Vdash \forall \underline{x}. \, (\underline{f}) \vdash \neg \exists \underline{x}. \, (\underline{f}) \Rightarrow \underline{k}]$

$[\text{goal2} \overset{\text{pyk}}{\to} \text{“goal2”}]$

$\ast \equiv \ast$

$[\mathsf{y} \equiv \mathsf{b} \overset{\text{tex}}{\to} \text{“\#1. \textbackslash equiv \#2.”}]$

$[\ast \equiv \ast \overset{\text{pyk}}{\to} \text{“" setequiv "”}]$

15

$* = *$

$[\mathsf{y} = \mathsf{b} \overset{\text{tex}}{\to}$ "#1. = #2."]

$[* = * \overset{\text{pyk}}{\to}$ "" setequals ""]

$\neg *$

$[\neg \mathsf{x} \overset{\text{tex}}{\to}$ "\neg #1."]

$[\neg * \overset{\text{pyk}}{\to}$ "lnot ""]

$* \wedge *$

$[\mathsf{x} \wedge \mathsf{y} \overset{\text{tex}}{\to}$ "#1. \wedge #2."]

$[* \wedge * \overset{\text{pyk}}{\to}$ "" land ""]

$* \vee *$

$[\mathsf{x} \vee \mathsf{y} \overset{\text{tex}}{\to}$ "#1. \vee #2."]

$[* \vee * \overset{\text{pyk}}{\to}$ "" lor ""]

$\forall * . \left(* \right)$

$[\forall \mathsf{y}. (\mathsf{b}) \overset{\text{tex}}{\to}$ "\forall #1. . \left(#2.\right)"]

$[\forall * . (*) \overset{\text{pyk}}{\to}$ "forall " dot " end forall"]

$\exists * . \left(* \right)$

$[\exists \mathsf{y}. (\mathsf{b}) \overset{\text{tex}}{\to}$ "\exists #1. . \left(#2.\right)"]

$[\exists * . (*) \overset{\text{pyk}}{\to}$ "exists " dot " end exists"]

$* \in *$

$[\mathsf{y} \in \mathsf{b} \overset{\text{tex}}{\to}$ "#1. \in #2."]

16

$[* \in * \overset{\text{pyk}}{\longrightarrow}$ "" setin ""$]$