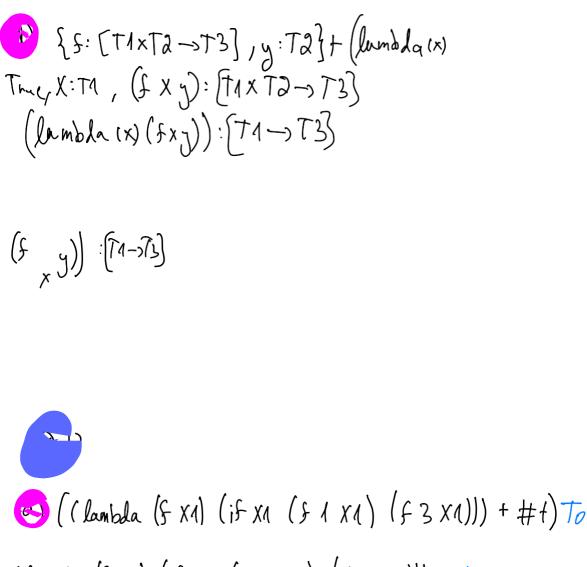
) →T2],g [T1 →T2] 1ª:T1} (A) { }: [TA +(s(g a)) :T2 false, q: T1 , g: [T1→T2] (g a)· [T1→T2] 5 S: [T1xT2→T3]} + (lambda (x) (fx 100): T2→T3 fulse(f x:tp), ft.Bt1xt2->T3BhN100: nyunberh Sin

(x) fx [T173>.73] \$\frac{1}{12} \left( \tau -) 73 \right) f

damble -\frac{1}{72} \right\right\right\left( \left\lamble (\tau x) (\frac{1}{7}x) \right) \right\right\right\left\lamble (\tau x) (\frac{1}{7}x) \right\ri

((lambla (x) (xx))):[T1->T2]



(lambda (f x1) (if x1 (f 1 x1) (f 3 x1))) T1 (if x1 (f 1 x1) (f 3 x1)) T2 X1 Tx

(51 X1) T3

ession Eq yation T1= (T+ \* T#+]->T0 ((lambda (f X1) (if X1 (f 1 X1) (f 3 X1))) + #1) (lambda (f X1) (if X1 (f 1 X1) (f 3 X1))) T1=[Tf \* TX] -> T2 (if x1 (}1 x1) (f3 x1)) T2: T3 T3= 74 TX = Boolean Tf = (Tnum/ \* Tx)-) T3 (7 V XV) Expr (7 3 XV) Tf: [Tuyn3\* tx 7-274 Ti= [ Number \* Number -) Number 4 TH+ = Boolean #1

Equation

Substitution

T1= (T+ \* T#+)->T0

{}

T1=[Ts \* Tx] → T2

T2: T3

T3= T4

TX = Boolean

Tf = (Tnym/ \* Tx)-) T3

Tf = (Tuum3\* Tx]->T4

Tt = [ Number \* Number] - Nymber

Equation

71 [[Ts \*Tx] -> To

To]

To : To

T3= T4 TX= Boolean

Tf = (Tnym/\* Tx)-) T3

Tf = [Tuym3\* tx]->T4

Tt=[Number \* Number]-) Number

Substitution

§71:= [T+ \* T#+]->

₩ · · · · ·

Equation T2: T3 T0} T3= 74 TX = Boolean Tf = (Tnym/\* Tx)-)T3 Tf ~ (Tuum3\* tx]->T4 Ti = [ Number \* Number] - Nymber Tf: T+ TY: T#+

TO=72

Substitution

{71:= [T+ \*T#+]->

Equation TOZ TX = Boolean Tf = (Tnym/ \* Tx)-) T3 Tf = (Tuum3\* Tx]->T4 Tt = [Number \* Number] -> Nymber Tf: T+ TX: T#+ TO=72 1a · T3

{71:= [T+ + T#+]->

Substitution

Equation

Substitution

TX = Boolean

{ 71:= [ T+ \* T#+] > TO}

Tf = (Tnym/\* Tx)->T3

Tf ~ [Tuym3\* tx]->T4

Tt=[Number \* Number]-Number

T5: T+

TX: T#+
Tn=T9

TO=T2

T3:T4

Equation

Tf: (Tnym/\* TX)-)T3

Tf: (Tnym/\* TX)-)T4

Tf: (Tuym/\* TX)-)T4

Ti: (Tuym/\* Nymber)-)Nymber

Tf: T+

Tx: T+

TO=T2 12:T3 T3:T4 Substitution

{71:= [T+ \* T#+]-> TO, Tx:: Boolenn}

Tf: T+ T1:= [[uumber\* number] -> number] \* T#J-> TO, T 4: T #+ Tf := [Trum + Hookan] -) T3, TO=72 71 := [Number \* Number] -> Number, Ta: T3 Tx:= Boolean } T3: T4 Thund=Tima3 アナ・ナ+ : '2 いから Tf:=[Tum1 \*Boolean] - Number] - Toun 1: Number

T1:=[Number \* Number] - Number] - Number

Boolean + Number SOX.(+ 001, =02,0 BC,1,1,2,4 19/1,0.

Boolean = Number Expression is not well typed.

Substitution

Equation

((lumbla (f1 x1 y1) (f1 x1 y1)) \* 13) TO

dy .

(lambda (f1 x1 y1) (f1 x1 y1)) T1 (f1 x1 y1) T2 f1 T5

X1 TX

y1 Ty \* T\*

1 Trum 1

3 Tnum 3

Equation Expression ((lumbla (f1 x1 y1) (f1 x1 y1)) \* 13) T1=[T\*\*Tunn1\*Tunn3]-sto ( lumbola ( f1 x1 y1) (f1 x1 y1)) T1:[7; \*Tx \* Ty]-> 72 TS=(Tx\*Ty)-)TZ (th x1 hr) Tx = [Number \* Vumber] - Number ¥ Toum1 = Number Tnum3 = Number Equation Substitution T1=[T\* \* Tunn 1 \* Tunn 3]- TO 23 71.[T; \*Tx \* Ty]→72 TS=(Tx\*Ty)-)TZ Tx = [Number \* Vunber] - Number Toum1 = Number Trym3 = Nymber

Tf = T\*

Tx = Tnum/

Ty: Thums

TO-72

Substitution

Substitution

Tunn1\*Tunn3]-TO}

£ quation Substitution Tx = [Number \* Vunber] - Number 4 Trunk Tunk ]- 5TO, T5= (Tx\*Ty)→TZ} Toumd = Number Tnum3 = Number Tf = T\* Tx = Trum1 Ty: Thums To: Ta Equation Substitution { T1:= (Number Number) -> Number Thun 1 Thum 3)-5TO, Tuum1 = Number Tnym3 = Nymber T5= (Tx\*Ty)-)T2 Tf = T\* Tx = [Number \*Vinber] - Number] Tx = Trum/ Ty: Thums 70=72

Equation Substitution { T1:= ([Number \* Number] -> Number \* Number \* Tum3]-5TO, Tnum3 = Number Tf = T# TS=[Tx\*Ty]-TZ Tx = Tnum/ Tx: [Number "Vunber]~ Number, Ty: Tnums To: Ta Tnum 1: Number } Substitution Equation { T1:= ([Number \* Number] -> Number] \* Number Number-20, Tf = T# Tx = Thum/ TS=[Tx\*Ty]->TZ Ty: Thums Tx - [Number "Vunber] - Number, To= ta Trum 1: Number, Tuum 3: Number} Substitution t quation { T1: [[Number \* Number] -> Number] \* Number Number -> TO, Tx = Tween 1 TS:=[Inum1\* Ty] -> TZ Ty= 1 numb Tx: = [Number \* Vumber] - Number, Tx= Unmber Trum 1:= Number, Tuam 3:= Number} Ty: Number Ta: Number

£ quation { T1:= ([Number "Number] -> Number] Number Number-20, Ty: Tnums To: Ta Tx: Number Ty: Number Ta: Number t quation T0=T2 Tx= Unnder

TX = [Number \*Vunber] - Number, Trum 1:= Number, Tunn 3: Number, Tx Tmul}

Ty: Number Ta: Number

Substitution

Substitution

{T1:= ([Number \* Number] -> Number] \* Number Number -> TO,

TS:=(turn1\*Tum) -> TZ Tx - [Number \* Vunber] - Number,

Trum 1:= Number, Tuam 3= Number, Tx: Tunnd, Ty:= Tunn34

TS=[turm1\*Ty] -> TZ

Tx= Unmber Ty: Number T2: Number £ quation

Equation

This [[Number Number] -> Number] Number Number] To,

This [Number \* Number] -> Number,

Thum 1:= Number, Tuum 3:= Number,

Tx:= Thum 1, Ty:= Tuum 3, To:= T2}

Substitution

Substitution

Ty: Number Ta: Number

TS:=[Number Tund] > TZ

Tk:=[Number \* Vunber] > Number,

Tund:=Number, Tuum 3:= Number,

{ T1: [[Number \* Number] -> Number] \* Number Number] -> TO,

Tx= Number, Ty= Tunn3, TO=T2}

{T1:= [Number Number] -> Number Number] -> T2. = [Number Number] -> T2, T2: Number Tx = [Number \* Vumber] - Number, Trum 1:= Number, Tuam 3:= Number, Tx: Number, Ty:= Number, To=T2} Substitution Equation { T1:= ([Number \* Number] -> Number) \* Number Number, TS=[Number Number] -> Number, Tx = [Number \* Vunber] - Number, Trum 1: Number, Tun 3: Number, Tx Mumber, Ty Number, Ta: Number, To:= Number] ((Lambda (S1: [Number\* Number] -) Number) [X1: Number] [y1: Number]) (f1 x1 y1) \* 13)

Equation

Substitution



## Typing rule define:

For every: type environment \_Tenv, variable declaration var expressions exp and type expressions typ:

If \_Tenv o {var : typ } |- exp : typ Then \_Tenv |- (define var exp) : void