Simply typed & calculus (STLC)

a a calculus term

operational semantics

a vawe is either a Bodean or
$$(\lambda \times \cdots)$$

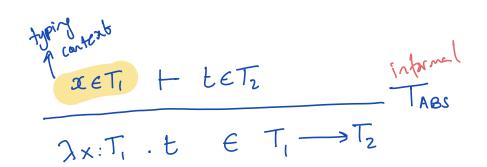
(i)
$$(\lambda x:T.t) \vee \longrightarrow [x \rightarrow v]t$$

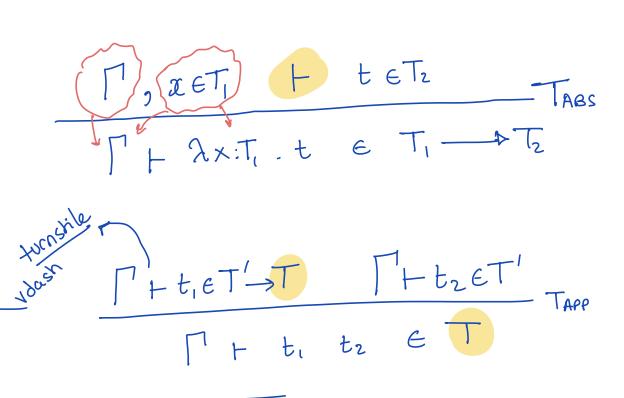
$$\underbrace{t_2 \longrightarrow t_2'}_{V \ t_2 \longrightarrow V \ t_2'}$$

Inhitian $x \in Int + x + x \in Int$ Typing

Context

a typing context Γ is a sequence of the form $x_1 \in T_1$, $x_2 \in T_2$, $x_3 \in T_3$, Γ can be empty (denoted Φ) Γ , $x \in T$





isters
$$0 \in Bool$$

Int > Bool

T

T

T

$$x \in T$$
 should prequence $T' = T$, $x \in T$

be inside of prequence $T' = T$, $x \in T$
 $T \in T$

E.g.

Inversion lemma

If $\Gamma \vdash \alpha \in \Gamma$ then $\alpha \in \Gamma \in \Gamma$ If $\Gamma \vdash \alpha \in \Gamma$ then $\alpha \in \Gamma \in \Gamma$ $R = T \rightarrow R'$ for some R' $S \cdot t \cdot \Gamma$, $\alpha \in \Gamma \vdash t \in R'$

Uniqueness

In a given of, a term t with free variables in that at most a single type

Canonial forms

① if v has type Bool then v is either tw/fls ② if v has type $T_1 \longrightarrow T_2$ then v is of the form $2x:T_1$. b

PRESERVATION

If $\Gamma \vdash t \in \Gamma$ and $t \longrightarrow t'$ then $\Gamma \vdash t' \in \Gamma$

PROGRESS Suppose \$ + tet Then t is a value or t -> t' for some t' PROOF Induction on typing derivations assume that t is of the form to the By inductive dypothesis 2 to is a value or At 1 -> to CASEA if $t, \longrightarrow t'$ $t \longrightarrow t'$ t_2 CASE B if t, is a value 1) to can take a step to to $t_1, t_2 \longrightarrow t_1, t_2$ t, and to are both rather t₁ t₂ By canonical forms ti = 2x: ... this meant t -> t'
through B-reduction

Erasure theorem

erase
$$(x) = x$$

erase $(t, t^2) = erase(t)$ erase (t^2)
erase $(\lambda x:T \cdot t) = \lambda x$ erase (t)

Thm

- If t -> t' under typed evaluation

- occase (t') under then erase (t) -> erase (t') under untyped eucluchen - if erase (t) - s m' then
there is a typed term t' s.t. $t \longrightarrow t'$ and erase (t') = m'