

Term variables,  $x, y, z$     variables  
Type variables,  $a, b$        type variables  
Integer,  $i$

Monotypes, $\tau$	$::=$ $ $ <b>Int</b> $ $ $a$ $ $ $\tau_1 \rightarrow \tau_2$	Monotypes
Rho-types, $\rho$	$::=$ $ $ $\tau$ $ $ $(\rho)$	Rho-types S
Polytypes, $\sigma$	$::=$ $ $ $\rho$ $ $ $\forall a. \sigma$ $ $ $[a \mapsto \tau] \sigma$	bind $a$ in $\sigma$ M
Terms, $t, u$	$::=$ $ $ $i$ $ $ $x$ $ $ $\lambda x. t$ $ $ $t u$ $ $ $\lambda(x :: \sigma). t$ $ $ <b>let</b> $x = u$ <b>in</b> $t$ $ $ $t :: \sigma$ $ $ $(t)$ $ $ $t[x \rightsquigarrow t']$	Literal Variable Abstraction Application Typed abstraction Local binding Type annotation  S M
<i>value</i> , $v$	$::=$ $ $ $i$ $ $ $\lambda x. t$ $ $ $\lambda(x :: \sigma). t$	 bind $x$ in $t$ bind $x$ in $t$
Typing contexts, $\Gamma$	$::=$ $ $ $\epsilon$ $ $ $\Gamma, x : \sigma$	empty context assumption
$fv$	$::=$ $ $ $fv(t)$	M
$ftvany$	$::=$ $ $ $ftv(\tau)$ $ $ $ftv(\rho)$ $ $ $ftv(\sigma)$ $ $ $ftv(\Gamma)$	M M M M
<i>terminals</i>	$::=$ $ $ $\longrightarrow$ $ $ $\rightarrow$ $ $ $::$ $ $ $fv$ $ $ $ftv$	

		$\in$
		$\notin$
		$\vdash$
<i>formula</i>	$::=$	
		<i>judgement</i>
		<b>value</b> $v$
		<b>uniq</b> $\Gamma$
		<b>closed</b> $\sigma$
		$a \notin ftvany$
		$x : \sigma \in \Gamma$
<i>JTyping</i>	$::=$	
		$\Gamma \vdash t : \sigma$
<i>JStep</i>	$::=$	
		$t \longrightarrow u$
<i>judgement</i>	$::=$	
		<i>JTyping</i>
		<i>JStep</i>
<i>user_syntax</i>	$::=$	
		Term variables
		Type variables
		Integer
		Monotypes
		Rho-types
		Polytypes
		Terms
		<i>value</i>
		Typing contexts
		<i>fv</i>
		<i>ftvany</i>
		<i>terminals</i>
		<i>formula</i>

$\Gamma \vdash t : \sigma$

$$\begin{array}{c}
\frac{}{\Gamma \vdash i : \mathbf{Int}} \quad \text{TYP\_INT} \\
\\
\frac{\text{uniq } \Gamma \quad x : \sigma \in \Gamma}{\Gamma \vdash i : \sigma} \quad \text{TYP\_VAR} \\
\\
\frac{\Gamma, x : \tau_1 \vdash t : \tau_2}{\Gamma \vdash (\lambda x. t) : (\tau_1 \rightarrow \tau_2)} \quad \text{TYP\_ABS} \\
\\
\frac{\Gamma \vdash t : \tau_1 \rightarrow \tau_2 \quad \Gamma \vdash u : \tau_1}{\Gamma \vdash t u : \tau_2} \quad \text{TYP\_APP}
\end{array}$$

$$\begin{array}{c}
\frac{\Gamma \vdash u : \sigma \quad \Gamma, x : \sigma \vdash t : \rho}{\Gamma \vdash \text{let } x = u \text{ in } t : \rho} \text{ TYP\_LET} \\
\\
\frac{\text{closed } \sigma \quad \Gamma \vdash t : \sigma}{\Gamma \vdash (t :: \sigma) : \sigma} \text{ TYP\_ANNOT} \\
\\
\frac{\Gamma \vdash t : \rho}{\Gamma \vdash t : \forall a. \rho} \text{ TYP\_GEN} \\
\\
\frac{\Gamma \vdash t : \forall a. \rho}{\Gamma \vdash t : [a \mapsto \tau] \rho} \text{ TYP\_INST}
\end{array}$$

$$\boxed{t \longrightarrow u}$$

$$\begin{array}{c}
\frac{u \longrightarrow u'}{\text{let } x = u \text{ in } t \longrightarrow \text{let } x = u' \text{ in } t} \text{ STEP\_LET1} \\
\\
\frac{}{\text{let } x = v \text{ in } t \longrightarrow t[x \rightsquigarrow v]} \text{ STEP\_LET} \\
\\
\frac{t \longrightarrow t'}{t \ u \longrightarrow t' \ u} \text{ STEP\_APP1} \\
\\
\frac{u \longrightarrow u'}{(\lambda x. t) \ u \longrightarrow (\lambda x. t) \ u'} \text{ STEP\_APP2} \\
\\
\frac{}{(\lambda x. t) \ v \longrightarrow t[x \rightsquigarrow v]} \text{ STEP\_APP} \\
\\
\frac{u \longrightarrow u'}{(\lambda(x :: \sigma). t) \ u \longrightarrow (\lambda(x :: \sigma). t) \ u'} \text{ STEP\_ANNOT\_APP2} \\
\\
\frac{}{(\lambda(x :: \sigma). t) \ v \longrightarrow t[x \rightsquigarrow v]} \text{ STEP\_ANNOT\_APP} \\
\\
\frac{}{t :: \sigma \longrightarrow t} \text{ STEP\_ERASE}
\end{array}$$

Definition rules: 16 good 0 bad  
 Definition rule clauses: 31 good 0 bad