x term variable
α type variable
T type

t	::=			term
	|	x		variable
	|	$\lambda(x : \tau) \to t$		abstraction
	|	$\lambda\{\alpha : \kappa\} \to t$		type abstraction
	|	$t_1\ t_2$		application
	|	$t[\tau]$		type application
	|	$t : \tau$		type annotation
	|	(t)	S	parenthesis
v	::=			value
	|	$\lambda(x : \tau) \to t$		abstraction
κ	::=			kind
	|	$*$		star
	|	$\kappa_1 \to \kappa_2$		kind arrow
	|	(κ)	S	parenthesis
τ	::=			type
	|	α		type variable
	|	T		type
	|	$\tau_1 \to \tau_2$		arrow
	|	$\lambda(\alpha : \kappa), \tau$		operator abstraction
	|	$\forall\, (\alpha : \kappa), \tau$		forall
	|	$\tau_1\ \tau_2$		operator application
	|	(τ)	S	parenthesis
Γ	::=			typing environment
	|	$\emptyset$		empty
	|	$\Gamma, x : \tau$		variable
	|	$\Gamma, T : \kappa$		abstract type
	|	$\Gamma, \alpha : \kappa$		type variable

$\boxed{[\alpha \mapsto \tau_1]\tau_2 \rhd \tau_3}$ Type substitution

$$\frac{}{[\alpha \mapsto \tau]\alpha \rhd \tau} \quad \textsc{SubstT\_Var1}$$

$$\frac{}{[\alpha_1 \mapsto \tau]\alpha_2 \rhd \alpha_2} \quad \textsc{SubstT\_Var2}$$

$$\frac{}{[\alpha \mapsto \tau]T \rhd T} \quad \textsc{SubstT\_Type}$$

$$\frac{\begin{array}{c}[\alpha \mapsto \tau_1]\tau_2 \rhd \tau_2' \\ [\alpha \mapsto \tau_1]\tau_3 \rhd \tau_3'\end{array}}{[\alpha \mapsto \tau_1]\tau_2 \to \tau_3 \rhd \tau_2' \to \tau_3'} \quad \textsc{SubstT\_Arrow}$$

$$\frac{}{[\alpha \mapsto \tau_1]\lambda(\alpha : \kappa), \tau_2 \rhd \lambda(\alpha : \kappa), \tau_2} \quad \textsc{SubstT\_Abs1}$$

$$\frac{[\alpha_1 \mapsto \tau_1]\tau_2 \rhd \tau_2'}{[\alpha_1 \mapsto \tau_1]\lambda(\alpha_2 : \kappa), \tau_2 \rhd \lambda(\alpha_2 : \kappa), \tau_2'} \quad \textsc{SubstT\_Abs2}$$

$$\frac{}{[\alpha \mapsto \tau_1]\forall\,(\alpha : \kappa), \tau_2 \rhd \forall\,(\alpha : \kappa), \tau_2} \quad \textsc{SubstT\_Forall1}$$

$$\frac{[\alpha_1 \mapsto \tau_1]\tau_2 \rhd \tau_2'}{[\alpha_1 \mapsto \tau_1]\forall\,(\alpha_2 : \kappa), \tau_2 \rhd \forall\,(\alpha_2 : \kappa), \tau_2'} \quad \textsc{SubstT\_Forall2}$$

$$\frac{\begin{array}{l}[\alpha \mapsto \tau_1]\tau_2 \rhd \tau_2' \\ [\alpha \mapsto \tau_1]\tau_3 \rhd \tau_3'\end{array}}{[\alpha \mapsto \tau_1]\tau_2\,\tau_3 \rhd \tau_2'\,\tau_3'} \quad \textsc{SubstT\_App}$$

$\boxed{\Gamma \vdash t : \tau}$ Typing rules

$$\frac{x : \tau \in \Gamma}{\Gamma \vdash x : \tau} \quad \textsc{T\_Var}$$

$$\frac{\begin{array}{l}\Gamma, x : \tau_1 \vdash t : \tau_2 \\ \Gamma \vdash \tau_1 : *\end{array}}{\Gamma \vdash \lambda(x : \tau_1) \to t : \tau_1 \to \tau_2} \quad \textsc{T\_Abs}$$

$$\frac{\begin{array}{l}\Gamma \vdash t_1 : \tau_2 \to \tau_1 \\ \Gamma \vdash t_2 : \tau_2\end{array}}{\Gamma \vdash t_1\,t_2 : \tau_1} \quad \textsc{T\_App}$$

$$\frac{\begin{array}{l}\Gamma, \alpha : \kappa \vdash t : \tau \\ \alpha \notin \Gamma\end{array}}{\Gamma \vdash \lambda\{\alpha : \kappa\} \to t : \forall\,(\alpha : \kappa), \tau} \quad \textsc{T\_TyAbs}$$

$$\frac{\begin{array}{l}\Gamma \vdash t : \forall\,(\alpha : \kappa), \tau_2 \\ \Gamma \vdash \tau_1 : \kappa \\ [\alpha \mapsto \tau_1]\tau_2 \rhd \tau_2'\end{array}}{\Gamma \vdash t[\tau_1] : \tau_2'} \quad \textsc{T\_TyApp}$$

$$\frac{\begin{array}{l}\Gamma \vdash t : \tau_2 \\ \tau_1 \equiv \tau_2\end{array}}{\Gamma \vdash (t : \tau_1) : \tau_1} \quad \textsc{T\_Annot}$$

$\boxed{\Gamma \vdash \tau : \kappa}$ Kinding

$$\frac{\alpha : \kappa \in \Gamma}{\Gamma \vdash \alpha : \kappa} \quad \textsc{K\_Var}$$

$$\frac{T : \kappa \in \Gamma}{\Gamma \vdash T : \kappa} \quad \textsc{K\_AbsType}$$

$$\frac{\Gamma, \alpha : \kappa_1 \vdash \tau : \kappa_2}{\Gamma \vdash \lambda(\alpha : \kappa_1), \tau : \kappa_1 \to \kappa_2} \quad \textsc{K\_Abs}$$

$$\frac{\begin{array}{l}\Gamma \vdash \tau_1 : \kappa_2 \to \kappa_1 \\ \Gamma \vdash \tau_2 : \kappa_2\end{array}}{\Gamma \vdash \tau_1\,\tau_2 : \kappa_1} \quad \textsc{K\_App}$$

$$\frac{\begin{array}{l}\Gamma \vdash \tau_1 : * \\ \Gamma \vdash \tau_2 : *\end{array}}{\Gamma \vdash \tau_1 \to \tau_2 : *} \quad \textsc{K\_Arrow}$$

$$\frac{\Gamma, \alpha : \kappa \vdash \tau : *}{\Gamma \vdash \forall\,(\alpha : \kappa), \tau : *} \quad \textsc{K\_Forall}$$

$\boxed{\tau_1 \equiv \tau_2}$ Type equivalence

$$\frac{}{\tau \equiv \tau} \quad \textsc{EQ\_Refl}$$

$$\frac{\tau_2 \equiv \tau_1}{\tau_1 \equiv \tau_2} \quad \textsc{EQ\_Symm}$$

$$\frac{\begin{array}{c}\tau_1 \equiv \tau_2 \\ \tau_2 \equiv \tau_3\end{array}}{\tau_1 \equiv \tau_3} \quad \textsc{EQ\_Trans}$$

$$\frac{}{\alpha \equiv \alpha} \quad \textsc{EQ\_Var}$$

$$\frac{}{T \equiv T} \quad \textsc{EQ\_AbsType}$$

$$\frac{\begin{array}{c}\tau_1 \equiv \tau_1' \\ \tau_2 \equiv \tau_2'\end{array}}{\tau_1 \to \tau_2 \equiv \tau_1' \to \tau_2'} \quad \textsc{EQ\_Arrow}$$

$$\frac{\tau_1 \equiv \tau_2}{\forall\,(\alpha : \kappa), \tau_1 \equiv \forall\,(\alpha : \kappa), \tau_2} \quad \textsc{EQ\_Forall}$$

$$\frac{\tau_1 \equiv \tau_2}{\lambda(\alpha : \kappa), \tau_1 \equiv \lambda(\alpha : \kappa), \tau_2} \quad \textsc{EQ\_Abs}$$

$$\frac{\begin{array}{c}\tau_1 \equiv \tau_1' \\ \tau_2 \equiv \tau_2'\end{array}}{\tau_1\,\tau_2 \equiv \tau_1'\,\tau_2'} \quad \textsc{EQ\_App}$$

$$\frac{[\alpha \mapsto \tau_2]\tau_1 \rhd \tau_1'}{(\lambda(\alpha : \kappa), \tau_1)\,\tau_2 \equiv \tau_1'} \quad \textsc{EQ\_AppAbs}$$

$\boxed{[x \mapsto v]t_1 \rhd t_2}$ substitution

$$\frac{}{[x \mapsto v]x \rhd v} \quad \textsc{Subst\_Var1}$$

$$\frac{}{[x_1 \mapsto v]x_2 \rhd x_2} \quad \textsc{Subst\_Var2}$$

$$\frac{}{[x \mapsto v]\lambda(x : \tau) \to t \rhd \lambda(x : \tau) \to t} \quad \textsc{Subst\_Abs1}$$

$$\frac{[x_1 \mapsto v]t_1 \rhd t_2}{[x_1 \mapsto v]\lambda(x_2 : \tau) \to t_1 \rhd \lambda(x_2 : \tau) \to t_2} \quad \textsc{Subst\_Abs2}$$

$$\frac{[x \mapsto v]t_1 \rhd t_2}{[x \mapsto v]\lambda\{\alpha : \kappa\} \to t_1 \rhd \lambda\{\alpha : \kappa\} \to t_2} \quad \textsc{Subst\_TAbs}$$

$$\frac{\begin{array}{c}[x \mapsto v]t_1 \rhd t_1' \\ [x \mapsto v]t_2 \rhd t_2'\end{array}}{[x \mapsto v]t_1\,t_2 \rhd t_1'\,t_2'} \quad \textsc{Subst\_App}$$

$$\frac{[x \mapsto v]t_1 \rhd t_2}{[x \mapsto v]t_1[\tau] \rhd t_2[\tau]} \quad \textsc{Subst\_TApp}$$

$$\frac{[x \mapsto v]t_1 \rhd t_2}{[x \mapsto v]t_1 : \tau \rhd t_2 : \tau} \quad \textsc{Subst\_Annot}$$

$\boxed{t_1 \longrightarrow t_2}$ Evaluation

$$\frac{t_2 \longrightarrow t_2'}{t_1\ t_2 \longrightarrow t_1\ t_2'} \quad \text{E\_App1}$$

$$\frac{t_1 \longrightarrow t_1'}{t_1\ v \longrightarrow t_1'\ v} \quad \text{E\_App2}$$

$$\frac{\begin{array}{l}[x \mapsto v]t \rhd t' \\ t' \longrightarrow t''\end{array}}{(\lambda(x : \tau) \to t)\ v \longrightarrow t''} \quad \text{E\_AppAbs}$$

$$\frac{t \longrightarrow t'}{\lambda\{\alpha : \kappa\} \to t \longrightarrow t'} \quad \text{E\_TAbs}$$

$$\frac{t \longrightarrow t'}{t[\tau] \longrightarrow t'} \quad \text{E\_TApp}$$

$$\frac{t \longrightarrow t'}{(t : \tau) \longrightarrow t'} \quad \text{E\_Annot}$$

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Definition rules:        45 good    0 bad
Definition rule clauses: 94 good    0 bad
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