termvar, x	term variable
typevar, α	type variable
natural, n	natural number
k	index

term, t	::=			term
	|	x		variable
	|	n		natural literal
	|	$t_1 + t_2$		addition
	|	$t_1 - t_2$		subtraction
	|	$\lambda x.t$	bind x in t	abstraction
	|	$\lambda x : \tau.t$	bind x in t	typed abstraction
	|	$t_1\ t_2$		application
	|	$\textbf{let}\ x = t_1\ \textbf{in}\ t_2$	bind x in t_2	let
	|	$\textbf{let}\ x : \sigma = t_1\ \textbf{in}\ t_2$	bind x in t_2	typed let
	|	$t : \sigma$		type ascription
	|	(t)	S	
basety, B	::=			base type
	|	$\mathbb{N}$		natural numbers
	|	$\mathbb{Z}$		integers
tycon, K	::=			type constructor
	|	Sum		sum type
	|	Prod		product type
type, τ	::=			monotype
	|	α		variable
	|	B		base type
	|	$\mathsf{K}\,\tau_1\,..\,\tau_k$		type constructor
	|	$\tau_1 \to \tau_2$		function type
	|	(τ)	S	
qualifier, Q	::=			qualifier
	|	add		additive
	|	sub		subtractive
polytype, σ	::=			polytype
	|	τ		monotype
	|	$\forall\,\alpha_1\,..\,\alpha_k.\tau$		forall
Γ	::=			type context
	|	$\varnothing$		empty context
	|	$\Gamma, x : \sigma$		cons
constraint, C	::=			constraint
	|	$\tau_1 \equiv \tau_2$		unification
	|	$\tau_1 \leq \tau_2$		subtype
	|	$Q\,\tau$		qualifier
	|	$\textbf{true}$		trivial
	|	$C_1 \wedge C_2$		conjunction
	|	$\forall\,\alpha_1\,..\,\alpha_k.C$	bind $\alpha_1..\alpha_k$ in C	universal

$\boxed{\Gamma \vdash t \triangleright \tau \rightsquigarrow C}$ t has inferred type τ in context Γ, generating constraints C

$$\frac{}{\Gamma \vdash n \triangleright \mathbb{N} \rightsquigarrow \mathbf{true}} \quad \text{INF\_NAT}$$

$$\frac{x : \sigma \in \Gamma \quad \sigma \sqsubseteq^{\triangleright} \tau \rightsquigarrow C}{\Gamma \vdash x \triangleright \tau \rightsquigarrow C} \quad \text{INF\_VAR}$$

$$\frac{\begin{array}{l}\alpha\,\text{fresh}\\ \Gamma \vdash t_1 \triangleright \tau_1 \rightsquigarrow C_1 \quad \Gamma \vdash t_2 \triangleright \tau_2 \rightsquigarrow C_2\end{array}}{\Gamma \vdash t_1 + t_2 \triangleright \alpha \rightsquigarrow C_1 \wedge C_2 \wedge \tau_1 \le \alpha \wedge \tau_2 \le \alpha \wedge \mathsf{add}\,\alpha} \quad \text{INF\_ADD}$$

$$\frac{\begin{array}{l}\alpha\,\text{fresh}\\ \Gamma \vdash t_1 \triangleright \tau_1 \rightsquigarrow C_1 \quad \Gamma \vdash t_2 \triangleright \tau_2 \rightsquigarrow C_2\end{array}}{\Gamma \vdash t_1 - t_2 \triangleright \alpha \rightsquigarrow C_1 \wedge C_2 \wedge \tau_1 \le \alpha \wedge \tau_2 \le \alpha \wedge \mathsf{sub}\,\alpha} \quad \text{INF\_SUB}$$

$$\frac{\Gamma, x : \tau_1 \vdash t \triangleright \tau_2 \rightsquigarrow C}{\Gamma \vdash \lambda x : \tau_1 . t \triangleright \tau_1 \to \tau_2 \rightsquigarrow C} \quad \text{INF\_TABS}$$

$$\frac{\begin{array}{l}\alpha_1\,\text{fresh} \quad \alpha_2\,\text{fresh}\\ \Gamma \vdash t_1 \triangleright \tau \rightsquigarrow C_1 \quad \Gamma \vdash t_2 \triangleleft \alpha_1 \rightsquigarrow C_2\end{array}}{\Gamma \vdash t_1\, t_2 \triangleright \alpha_2 \rightsquigarrow C_1 \wedge C_2 \wedge \tau \equiv \alpha_1 \to \alpha_2} \quad \text{INF\_APP}$$

$$\frac{\begin{array}{l}\Gamma \vdash t_1 \triangleright \tau_1 \rightsquigarrow C_1\\ \Gamma, x : \tau_1 \vdash t_2 \triangleright \tau_2 \rightsquigarrow C_2\end{array}}{\Gamma \vdash \mathbf{let}\, x = t_1\, \mathbf{in}\, t_2 \triangleright \tau_2 \rightsquigarrow C_1 \wedge C_2} \quad \text{INF\_LET}$$

$$\frac{\begin{array}{l}\Gamma \vdash^{\text{poly}} t_1 \triangleleft \sigma \rightsquigarrow C_1\\ \Gamma, x : \sigma \vdash t_2 \triangleright \tau \rightsquigarrow C_2\end{array}}{\Gamma \vdash \mathbf{let}\, x : \sigma = t_1\, \mathbf{in}\, t_2 \triangleright \tau \rightsquigarrow C_1 \wedge C_2} \quad \text{INF\_TLET}$$

$$\frac{\Gamma \vdash^{\text{poly}} t \triangleleft \sigma \rightsquigarrow C_1 \quad \sigma \sqsubseteq^{\triangleright} \tau \rightsquigarrow C_2}{\Gamma \vdash t : \sigma \triangleright \tau \rightsquigarrow C_1 \wedge C_2} \quad \text{INF\_ASCRIBE}$$

$\boxed{\Gamma \vdash^{\text{poly}} t \triangleleft \sigma \rightsquigarrow C}$ t has checked polytype σ in context Γ, generating constraints C

$$\frac{\alpha_1 \mathinner{..} \alpha_k\,\text{fresh} \quad \Gamma \vdash t \triangleleft \tau \rightsquigarrow C}{\Gamma \vdash^{\text{poly}} t \triangleleft \forall\, \alpha_1 \mathinner{..} \alpha_k . \tau \rightsquigarrow \forall\, \alpha_1 \mathinner{..} \alpha_k . C} \quad \text{CHKP\_OPEN}$$

$\boxed{\Gamma \vdash t \triangleleft \tau \rightsquigarrow C}$ t has checked type τ in context Γ, generating constraints C

$$\frac{x : \sigma \in \Gamma \quad \sigma \sqsubseteq^{\triangleleft} \tau \rightsquigarrow C}{\Gamma \vdash x \triangleleft \tau \rightsquigarrow C} \quad \text{CHK\_VAR}$$

$$\frac{\Gamma \vdash t_1 \triangleleft \tau \rightsquigarrow C_1 \quad \Gamma \vdash t_2 \triangleleft \tau \rightsquigarrow C_2}{\Gamma \vdash t_1 + t_2 \triangleleft \tau \rightsquigarrow C_1 \wedge C_2 \wedge \mathsf{add}\,\tau} \quad \text{CHK\_ADD}$$

$$\frac{\Gamma \vdash t_1 \triangleleft \tau \rightsquigarrow C_1 \quad \Gamma \vdash t_2 \triangleleft \tau \rightsquigarrow C_2}{\Gamma \vdash t_1 - t_2 \triangleleft \tau \rightsquigarrow C_1 \wedge C_2 \wedge \mathsf{sub}\,\tau} \quad \text{CHK\_SUB}$$

$$\frac{\begin{array}{l}\alpha_1\,\text{fresh} \quad \alpha_2\,\text{fresh}\\ \Gamma, x : \alpha_1 \vdash t \triangleleft \alpha_2 \rightsquigarrow C\end{array}}{\Gamma \vdash \lambda x . t \triangleleft \tau \rightsquigarrow C \wedge \tau \equiv \alpha_1 \to \alpha_2} \quad \text{CHK\_ABS}$$

$$\frac{\begin{array}{l}\Gamma \vdash t_1 \triangleright \tau_1 \rightsquigarrow C_1\\ \Gamma, x : \tau_1 \vdash t_2 \triangleleft \tau_2 \rightsquigarrow C_2\end{array}}{\Gamma \vdash \mathbf{let}\, x = t_1\, \mathbf{in}\, t_2 \triangleleft \tau_2 \rightsquigarrow C_1 \wedge C_2} \quad \text{CHK\_LET}$$

$$\frac{\Gamma \vdash^{\text{poly}} t_1 \triangleleft \sigma \rightsquigarrow C_1 \qquad \Gamma, x : \sigma \vdash t_2 \triangleleft \tau \rightsquigarrow C_2}{\Gamma \vdash \textbf{let}\, x : \sigma = t_1 \,\textbf{in}\, t_2 \triangleleft \tau \rightsquigarrow C_1 \wedge C_2} \quad \text{CHK\_TLET}$$

$$\frac{\Gamma \vdash^{\text{poly}} t \triangleleft \sigma \rightsquigarrow C_1 \quad \sigma \sqsubseteq^{\triangleleft} \tau \rightsquigarrow C_2}{\Gamma \vdash t : \sigma \triangleleft \tau \rightsquigarrow C_1 \wedge C_2} \quad \text{CHK\_ASCRIBE}$$

$$\frac{\Gamma \vdash t \triangleright \tau_1 \rightsquigarrow C}{\Gamma \vdash t \triangleleft \tau_2 \rightsquigarrow C \wedge \tau_1 \leq \tau_2} \quad \text{CHK\_INFER}$$

$\boxed{\sigma \sqsubseteq^{\triangleright} \tau \rightsquigarrow C}$ τ is more specific than σ (inference mode), generating constraints C

$$\frac{\alpha_1 \mathinner{..} \alpha_k \text{ fresh}}{\forall\, \alpha_1 \mathinner{..} \alpha_k.\tau \sqsubseteq^{\triangleright} \tau \rightsquigarrow \textbf{true}} \quad \text{SS\_INST}$$

$\boxed{\sigma \sqsubseteq^{\triangleleft} \tau \rightsquigarrow C}$ τ is more specific than σ (checking mode), generating constraints C

$$\frac{\alpha_1 \mathinner{..} \alpha_k \text{ fresh}}{\forall\, \alpha_1 \mathinner{..} \alpha_k.\tau_1 \sqsubseteq^{\triangleleft} \tau_2 \rightsquigarrow \tau_1 \leq \tau_2} \quad \text{SC\_INST}$$

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Definition rules:        20 good    0 bad
Definition rule clauses: 47 good    0 bad
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