

Valid ( $\varepsilon$ )

$$\frac{\text{Valid}(\Gamma) \quad \Gamma \vdash x : \text{Type } J}{\text{Valid}(\Gamma, x : J)}$$

$$\frac{\Gamma(x) = J}{\Gamma \vdash x : \text{inftype } J}$$

$$\frac{\Gamma \vdash \text{Prop} : \text{inftype } *}{\Gamma \vdash * : \text{inftype } *}$$

data InfTerm =  
 | \*  
 |  $\Pi$  InfTerm InfTerm  
 | Bound Int  
 | Free Name  
 | InfTerm :@: InfTerm  
 | Constant Name  
 | Cst InfTerm InfTerm  
 | Prop

$$\frac{\Gamma \vdash \rho : \text{ofType } * \quad \rho \Downarrow J \quad \Gamma \vdash e : \text{ofType } J}{\Gamma \vdash e : \rho : \text{inftype } J}$$

$$\Gamma \vdash * : \text{inftype } *$$

$$\frac{\Gamma, x : J \vdash \rho' : \text{ofType } * \quad \Gamma \vdash \rho : \text{ofType } * \quad \rho \Downarrow J}{\Gamma \vdash \Pi x : J. \rho. \rho' : \text{inftype } *}$$

$$\frac{\Gamma \vdash e : \text{inftype } J' \quad J = J'}{\Gamma \vdash e : \text{ofType } J}$$

$$\frac{\Gamma \vdash e : \text{inftype } \Pi x : J. J' \quad \Gamma \vdash \Pi x : J. J' : \text{inftype } * \quad \Gamma \vdash e' : \text{ofType } J \quad J'[x \mapsto e] \Downarrow J''}{\Gamma \vdash e e' : \text{inftype } J''}$$

Cons:  $\forall$

$$\frac{\Gamma(c) = J}{\Gamma \vdash c : \text{inftype } J}$$

Range TList :  $\Pi \text{min} : \text{Nat}, \Pi \text{max} : \text{Nat}, \Pi _ : \text{min} < \text{max}, *$

$_ :: \Pi \text{min} : \text{Nat}, \Pi \text{max} : \text{Nat}, \Pi p : \text{min} < \text{max}, \Pi n : \text{Nat}, \Pi _ : \text{min} < n, \Pi _ : n < \text{max}, \text{Range List min max } P \Pi x : J. J' : \text{ofType } *$

$\lambda x. e : \text{ofType } \Pi x : J. J'$

→\*  
→prop

$$\frac{\text{cd } \Gamma \quad \Gamma \vdash Id \text{ ofType } * \quad C_n: J_n, \Gamma \vdash XS \quad \text{define } \Gamma'}{\Gamma \vdash \text{data } C_n: J_n \quad XS \quad \text{define } \Gamma' \cup (C_n: J_n, \Gamma)}$$

$$\Gamma = \left\{ \begin{array}{l} C \text{ Nat} \mapsto *, \quad C2 \mapsto C\text{Nat}, \quad CS \mapsto \Pi \text{ CNat}. C\text{Nat}, \\ C \text{ Vec} \mapsto \Pi -: (C\text{Nat}. (\Pi -: *. *)) \\ C \text{ Nil} \mapsto \Pi a: *. ((C\text{Nat } @: C2) : @: a), \\ C \text{ Cons} \mapsto \Pi a: *. \Pi n: C\text{Nat}. \Pi -: a. \Pi -: (C\text{Vec } : @ a) : @: n). (C\text{Vec } : @ a) : @: n) \end{array} \right\}$$

$$\frac{\Gamma \vdash \varepsilon \quad \text{define } \varepsilon}{\Gamma \vdash \varepsilon \quad \text{define } \varepsilon} \quad \frac{\Gamma \vdash XS \quad \text{define } \Gamma' \quad C_n \notin \Gamma' \cup \Gamma}{\Gamma \vdash (C_n: J_n, XS) \quad \text{define } C_n: J_n, \Gamma'} \quad \frac{\Gamma \vdash J_n \text{ ofType } *}{\Gamma \vdash J_n \text{ ofType } *}$$

$$C_n: T_0 \dots \rightarrow J_d$$

$$\Gamma \vdash e \text{ inferType } J \quad \Gamma \vdash Ct \text{ inferType } Prop$$

$$\Gamma \vdash Ctx \vdash e \text{ inferType } J$$

$$\Gamma H(C\text{Cons } @: C2) @ (C\text{Cons } @: CS2) @ C\text{Nil} \text{ ofType } (C\text{Vec } @ C\text{Nat}) @ CS @ (CS @ C2)$$