1 CESK

$$\varsigma \longmapsto_{CESK} \varsigma'$$

$\langle x, \rho, \sigma, \kappa\rangle$	$\langle v, \rho', \sigma, \kappa\rangle$ where $\sigma(\rho(x)) = (v, \rho')$
$\langle (e_0 e_1), \rho, \sigma, \kappa\rangle$	$\langle e_0, \rho, \sigma, \mathbf{ar}(e_1, \rho, \kappa)\rangle$
$\langle v, \rho, \sigma, \mathbf{ar}(e, \rho', \kappa)\rangle$	$\langle e, \rho', \sigma, \mathbf{fn}(v, \rho, \kappa)\rangle$
$\langle v, \rho, \sigma, \mathbf{fn}((\lambda x.e), \rho', \kappa)\rangle$	$\langle e, \rho'[x \mapsto a], \sigma[a \mapsto (v, \rho)], \kappa\rangle$ where $a \notin dom(\sigma)$

$$\begin{array}{rcll} \varsigma & \in & \Sigma & = & Exp \times Env \times Store \times Kont \\ \rho & \in & Env & = & Var \to_{\text{fin}} Addr \\ \sigma & \in & Store & = & Addr \to_{\text{fin}} Storable \\ s & \in & Storable & = & Val \times Env \\ a, b, c & \in & Addr & & \text{an infinite set.} \end{array}$$

2 Lazy CESK

$$\varsigma \longmapsto_{LazyCESK} \varsigma'$$

$\langle x, \rho, \sigma, \kappa\rangle$	$\langle v, \rho', \sigma, \kappa\rangle$ where $\sigma(\rho(x)) = (v, \rho')$
$\langle x, \rho, \sigma, \kappa\rangle$	$\langle v, \rho', \sigma, \mathbf{st}(a, \kappa)\rangle$ where $\sigma(a = \rho(x)) = \boldsymbol{\theta}(v, \rho')$
$\langle (e_0 e_1), \rho, \sigma, \kappa\rangle$	$\langle e_0, \rho, \sigma, \mathbf{ar}(e_1, \rho, \kappa)\rangle$
$\langle x, \rho, \sigma, \mathbf{st}(a, \kappa)\rangle$	$\langle x, \rho, \sigma[a \mapsto \boldsymbol{\epsilon}(x, \rho)], \kappa\rangle$
$\langle (\lambda x.e), \rho, \sigma, \mathbf{ar}(v, \rho', \kappa)\rangle$	$\langle e, \rho[x \mapsto a], \sigma[a \mapsto \boldsymbol{\theta}(v, \rho')], \kappa\rangle$ where $a \notin dom(\sigma)$

$$\begin{array}{rcll} \varsigma & \in & \Sigma & = & Exp \times Env \times Store \times Kont \\ \rho & \in & Env & = & Var \to_{\text{fin}} Addr \\ \sigma & \in & Store & = & Addr \to_{\text{fin}} Storable \\ s & \in & Storable & ::= & \boldsymbol{\theta}(v, \rho) \\ & & & | & \boldsymbol{\epsilon}(v, \rho) \\ \kappa & \in & Kont & ::= & \mathbf{mt} \\ & & & | & \mathbf{ar}(e, \rho, \kappa) \\ & & & | & \mathbf{st}(a, \kappa) \\ a, b, c & \in & Addr & & \text{an infinite set.} \end{array}$$

When evaluated, the thunk $\boldsymbol{\theta}(v, \rho)$ is replaced in the store with the evaluated version $\boldsymbol{\epsilon}(v', \rho')$.