CS320 Programming Languages
Homework #4

Due : 10 April 2019 before 2:30PM

Student id: 20150499 Name: 위희주 (Wi Heeju)

Consider the following `F1WAE`

$d ::=$	`{deffun {`x x`} `e`}`	function definition	$d \in$	`FunDef`
$e ::=$	n	number	$e \in$	`F1WAE`
	`{+ `e e`}`	addition	$n \in$	$\mathbb{Z}$
	`{with {`x e`} `e`}`	identifier introduction	$x \in$	Var
	x	identifier	$\sigma \in$	$Var \xrightarrow{\text{fin}} \mathbb{Z}$
	`{`x e`}`	function application	$\Lambda \in$	$Var \xrightarrow{\text{fin}} \texttt{FunDef}$

Write the operational semantics of the form $\boxed{\sigma, \Lambda \vdash e \Rightarrow n}$.

$$\sigma, \Lambda \vdash n \Rightarrow n$$

$$\frac{\sigma, \Lambda \vdash e_1 \Rightarrow n_1 \quad \sigma, \Lambda \vdash e_2 \Rightarrow n_2}{\sigma, \Lambda \vdash \{+\ e_1\ e_2\} \Rightarrow n_1 + n_2}$$

$$\frac{\sigma, \Lambda \vdash e_1 \Rightarrow v_1 \quad \sigma[x_1 \mapsto v_1], \Lambda \vdash e_2 \Rightarrow v_2}{\sigma, \Lambda \vdash \{\text{with}\ \{x_1\ e_1\}\ e_2\} \Rightarrow v_2}$$

$$\frac{x \in \text{Domain}(\sigma)}{\sigma, \Lambda \vdash x \Rightarrow \sigma(x)}$$

$$\frac{\sigma, \Lambda \vdash e_1 \Rightarrow v_1 \quad \Lambda(x_1) = \{\text{deffun}\{x_1\ x_2\}\ e_2\} \quad \sigma, \Lambda[x_2 \mapsto v_1] \vdash e_2 \Rightarrow v_2}{\sigma, \Lambda \vdash \{x_1\ e_1\} \Rightarrow v_2}$$