CS320 Programming Languages
Exercise #8

Consider `TpolyFAE`.

$$\frac{\alpha \notin \text{Domain}(\Gamma) \quad \Gamma[\alpha] \vdash e : \tau}{\Gamma \vdash \Lambda\alpha.e : \forall\alpha.\tau} \qquad \frac{\Gamma \vdash \tau_0 \quad \Gamma \vdash e : \forall\alpha.\tau_1}{\Gamma \vdash e[\tau_0] : \tau_1[\alpha \leftarrow \tau_0]}$$

$$\frac{\alpha \in \text{Domain}(\Gamma)}{\Gamma \vdash \alpha} \qquad \frac{\Gamma[\alpha] \vdash \tau}{\Gamma \vdash \forall\alpha.\tau}$$

Rewrite the following expression using explicit annotations of polymorphic types with $\Lambda\alpha.$ and $[\tau]$ to replace all the occurrences of ? with types and to make function calls to take explicit type arguments. For example, if a given expression is $(\lambda x : ?.x)\ 1$, then the answer is $(\Lambda\alpha.\lambda x{:}\alpha.x)[\mathsf{num}]\ 1$.

$$\begin{array}{l}\mathsf{val}\ f{:}\,? = \lambda g{:}\,?.\lambda v{:}\,?.g\ v;\\ \mathsf{val}\ g{:}\,? = \lambda x{:}\,?.x;\\ f\ g\ 10\end{array}$$