1. Compute the denotational semantics of
   \[ f(3) \text{ where } f(x) = \begin{cases} 0 & \text{if } x = 0 \\ f(x+1) & \text{otherwise} \end{cases} \]

2. Compute the denotational semantics of
   \[ f(3) \text{ where } f(x) = \begin{cases} 0 & \text{if } x = 0 \\ f(f(x-1)) & \text{otherwise} \end{cases} \]

3. Consider the applicative structure \((\Lambda, \cdot)\) of untyped lambda terms with application and with \(=_{\beta\eta}\) as equality.
   (a) Is it extensional?
   (b) Is it combinatory complete?

4. Consider the applicative structure \((\{a, b\}^*, \cdot)\) of strings over \{a, b\} with concatenation and string equality.
   (a) Is it extensional?
   (b) Is it combinatory complete?

5. Consider the applicative structure of combinatory logic: terms built from \(K\) and \(S\) using application as equality \(K x y = x, S x y z = x z (y z)\).
   (a) Is it extensional?
   (b) Is it combinatory complete?