Homework 6. Programming Language Design & Analysis (CSE 497)

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Due date: Oct. 22nd in class.

1. (2 points) Draw a derivation for the following subtyping judgments

\{a : \text{Top}, \ b : \{\} \to \{\}, \ c : \{x : \text{Nat}\}\} <: \{b : \{\} \to \text{Top}, \ c : \{\}\}\}

2. (3 points) The theorem below can be proved by induction over the derivation of $S <: T_1 \to T_2$. Prove it.

If $S <: T_1 \to T_2$, then $S$ has the form $S_1 \to S_2$, with $T_1 <: S_1$ and $S_2 <: T_2$.

3. (5 points) For each of the types below, write down a term in System F that has that type. Also write down the typing derivation for your term.

- $\forall X. X \to X$
- $\forall X. X \to X \to X$ (write two different terms that have this type)
- $\forall X. \forall Y. X \to Y \to Y$
- $\forall X. \forall Y. (X \to Y) \to X \to Y$
- $\forall X. (X \to X) \to X \to X$ (write two different terms that have this type)