CS 565 Spring 2022 Homework 5
(Axiomatic Semantics Again)

Your name: _____

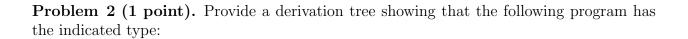March 14, 2022

Problem 1 (2 points). What is the weakest precondition for each of the following:

a. $\mathsf{wp}(\ X := X + 1,\ \{X > 5\})$

b. $\mathsf{wp}(\ X := Y,\ \{X \neq Y\})$

c. $\mathsf{wp}(\ X := X + 1;\ Y := Z,\ \{X = Y\})$

d. $\mathsf{wp}(\ \textbf{if}\ (X < 10)\textbf{then}\ Z := X\ \textbf{else}\ Z := Y,\ \{Z < 10\})$

Problem 2 (1 point). Provide a derivation tree showing that the following program has the indicated type:

$$f : \text{Bool} \rightarrow \text{Bool} \vdash f \text{ (\textbf{if} false \textbf{then} true \textbf{else} false): Bool}$$

Problem 3 (1 point). Provide a derivation tree showing that the following program has the indicated type:

$$f : \text{Bool} \rightarrow \text{Bool} \vdash \lambda x : \text{Bool}. f \text{ (\textbf{if} x \textbf{then} false \textbf{else} true): Bool}$$

Problem 4 (1 point). Provide a context Γ under which the term $f\ x\ y$ has type bool. Can you give a simple description of the set of *all* such contexts?