Assignment 3

CSE 6341

Due: April 19, by 12:25 pm (submit at carmen.osu.edu)

This assignment contains 3 questions, for a total of 20 points.

1. (5 pts) Consider the *big-step* operational semantics defined in class. Show the entire derivation tree for deriving $\langle \texttt{if x} > \texttt{y then y} := \texttt{x} + \texttt{y else y} := \texttt{x} - \texttt{y}, \sigma\rangle \to \sigma'$ where $\sigma(\texttt{x}) = 7$, $\sigma(\texttt{y}) = 2$, $\sigma'(\texttt{x}) = 7$, $\sigma'(\texttt{y}) = 9$.

2. (10 pts) Which of the following results (i.e., Hoare triples) are valid?

   (a) `{ true } x := 2 { true }`

   (b) `{ true } x := x { false }`

   (c) `{ false } x := 2 { true }`

   (d) `{ false } x := 2 { false }`

   (e) `{ true } while true do x := 2 { false }`

   (f) `{ true } x := x + 1 { x = x + 1 }`

   (g) `{ x = y } t := x;  x := y;  y := t { x = y }`

   (h) `{ x >= 0 } x := y { y >= 0 }`

   (i) `{ x = 0 } while x < 10 do x := x - 1 { x = x + 1 }`

   (j) `{ x = 0 } while x < 10 do x := x + 1 { x = x + 1 }`

3. (5 pts) Consider the following valid triple

```
{true}
if x>y then z:=(y-x)-1 else z:=(x-y)-1;
z:=1-12*z
{ z>=10 }
```

   Show the entire derivation tree for deriving this triple, using the axiomatic semantics rules discussed in class. The "bottom" (i.e. root) of the tree should be this triple. A leaf of the tree is either (1) a triple that can be directly derived from an axiom, or (2) an implication $\alpha \Rightarrow \beta$ used in the rule of consequence. You **must** show **explicitly** all implications $\alpha \Rightarrow \beta$ you have used when applying the rule of consequence.