University of Toronto, St. George Campus
Department of Computer Science

CSC 236H
Winter 2007

Assignment #4

Due Date: Wenesday, March 28 at 10:00am

1. Consider the following algorithm to find the reverse of a string:

```
public static String reverse( String s ) {
   String ans;
   if( s.length() < 2 ) {
      ans = s;
   } else {
      ans = s.charAt( s.length() - 1 )
              + reverse( s.substring( 0, s.length() - 1 ) );
   }
   return ans;
}
```

   (a) State a precondition and postcondition for the method.

   (b) Using the techniques discussed in class, prove that the method is correct with respect to the precondition/postcondition pair you gave in part (a).

2. Find DNF and CNF formulas that are logically equivalent to $(P \to Q) \to (Q \wedge R)$. Show all of your work.

3. Consider each pair of propositional formulas. Are the two formulas logically equivalent? Prove or disprove your answer, without using truth tables.

   (a) $R \vee (Q \wedge R)$ $\quad$ $\neg R \to ((S \wedge R) \wedge R)$

   (b) $((\neg R \vee P) \to P) \wedge P$ $\quad$ $\neg((Q \to (P \vee Q)) \leftrightarrow \neg P)$

   (c) $\neg P \vee \neg Q \vee (S \vee (T \wedge P))$ $\quad$ $(\neg P \vee \neg Q) \wedge (S \vee T) \wedge (S \vee P)$

   (d) $(Q \to (S \vee (T \wedge P))) \vee \neg P$ $\quad$ $(P \wedge Q) \to ((S \vee T) \wedge (S \vee P))$

4. Prove that $\{\oplus, \to\}$ is a complete set of connectives, where $\oplus$ is the exclusive OR connective.

5. Using induction, prove that if we have $n+1$ valid propositional formulas $P_0, \ldots, P_n$, and P_i LEQV P_{i+1} for all $i \in \{0, ..., n-1\}$, then P_0 LEQV P_n.