Homework 3

Due date: Jan 30, 2020, 9:30am

Objective

- Express statements given by natural language in symbolic form.
- Evaluate logic expressions.
- Identify logically equivalent expressions.
- Write formal pre- and postconditions using propositional logic.

Exercises

1. (8 points)
   Remove the unnecessary parentheses from the following formulas.
   a) $(r \vee (\neg q)) \longrightarrow \neg(r \vee p)$
   b) $((\neg p \wedge q) \leftrightarrow r) \longrightarrow (r \longrightarrow (\neg p \vee q))$

2. (10 points)
   Construct the truth table for each of the propositions below. Observe the precedence rules!
   a) $p \longrightarrow \neg q \vee \neg p$
   b) $p \wedge q \leftrightarrow p \rightarrow q \vee r$

3. (10 points)
   a) Which of the following propositions are logically equivalent to the proposition $(p \vee q) \wedge \neg(p \wedge q)$?
      - $(p \wedge q) \vee \neg(p \vee q)$
      - $(p \wedge \neg q) \vee (\neg p \wedge q)$
      - $\neg(p \wedge q) \vee p \vee q$
      - $(\neg p \vee \neg q) \wedge (p \vee q)$

   b) Which of the following propositions are logically equivalent to the proposition $p \wedge (p \rightarrow \neg q) \rightarrow q$?
      - $p \wedge \neg q$
      - $p \wedge q$
      - $\neg p \vee q$
      - $\neg p \vee \neg q$

4. (12 points)
   i. Download the project CS3151HW3 from the course website and open it in Eclipse.

   ii. In class `HW3Math` in the `util` package, write formal pre- and postconditions for the method `calculateRoots` and `checkForRightAngle`. Then add Java code to implement the methods. The pre- and postconditions have to meet the description in the given documentation.

   iii. Turn in a printout of the pre- and postconditions and of the method code together with your other solutions for this homework assignment. I will not check out Java projects. (You can just print and attach the entire class specification. A printer is available in the Advanced Computing Lab.)

5. (10 points)
   In project `CS3151HW3`, determine if the implementations of the methods of class `HW3Map` in the `model` package meet their given postcondition. In particular, mark the correct answer for the methods below:

   a) Method `contains` meets postcondition: YES / NO

   b) Method `remove` meets postcondition: YES / NO

   c) Method `add` meets postcondition: YES / NO

   d) Method `setSpecialValue` meets postcondition: YES / NO

   e) Method `getValueLength` meets postcondition: YES / NO

Submission

Turn in a hard-copy with your solutions at the beginning of the class meeting on Jan 30. The solutions can be hand-written or typed.