Fall 2016 COT 3100 Section 1 Homework 1
Assigned: 8/22/2016
Due: 8/26/2016

1) Create a truth table from scratch to evaluate the Boolean expression below. Your table should have 8 rows. While the number of columns may vary between responses make sure to create enough intermediate columns (so a minimum of 6 columns).

$$(\overline{p \wedge q}) \vee ((\overline{r \vee p}) \wedge q)$$

2) Perform the following bitwise operations on 8-bit unsigned integers. Please show your work (so that we know you understand how to do this instead of just plugging it into a compiler.)

a) `47 ^ 98 (xor)`
b) `13 & 211 (and)`
c) `99 | 131 (or)`
d) `13 << 3 (left shift)`
e) `198 >> 4 (right shift)`

3) Show that the two following expressions are logically equivalent using the laws of logic:

a) $p \vee ((p \wedge (r \vee (\bar{r} \vee p))) \wedge q)$

b) p

Make sure to show every step and clearly label each step. If you feel it's obvious you may combine two steps in one, listing both rules applied.

4) Create your own logic equivalence problem by finding two logical expressions that appear different but are logically equivalent. After showing your two expressions, explain ***how*** you created the problem. (Note: Most of the grade on this problem is based upon your explanation and not the two expressions.)

5) Recount a paragraph or so about the contributions of Ada Lovelace, related to computer science. (You may do your research from anywhere, but please do not plagiarize. Write things in your own words.)

6) The recommended course textbook uses Boolean logic to describe a valid solution to a Sudoku puzzle. Imagine a tic-tac-toe board filled with trues and falses where the trues stand for a square with an X in it and the falses stand for a square with an O in it. Assign names to appropriate Boolean variables and create a Boolean expression that is true if and only if the team with X has won. (Note that since the contents of squares are limited to two things, we can only evaluate tic-tac-toe boards that have an X or O in every square.)