COT 3100 Fall 2017 Homework #1
Please Consult WebCourses for the due date/time

1) Write out a truth table for the following logical expressions:

a) $[p \wedge (p \rightarrow q)] \rightarrow q$ b) $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

c) $p \wedge \neg(q \wedge (\neg p \vee r))$

2) Determine all truth value assignments for the primitive statements p, q, r, s, t that make the following expression false: $[(p \wedge q) \wedge r] \rightarrow (s \vee t)$.

3) Negate the following boolean expression and simplify the result as much as possible. Please show each step and name the rule you are using at each step:

$$p \vee q \vee (\neg p \wedge \neg q \wedge r)$$

4) Show that the following two logical expressions are equivalent using the laws of logic:

$(p \rightarrow q) \wedge [\neg q \wedge (r \vee \neg q)]$ and $\neg(q \vee p)$

5) Prove the following logical argument using the rules of implication. Please show each step and state which rule you use.

$(\neg p \vee q) \rightarrow r$
$r \rightarrow (s \vee t)$
$\neg s \wedge \neg u$
$\neg u \rightarrow \neg t$

$\therefore p$

6) Create simple statements for p, q, r, s, t and u for problem number 5 above that make reasonable sense in real life.

7) Let ? be an unknown boolean logical operator. The logical statement $[(\neg p \wedge q) \vee r] \Rightarrow (q \ ? \ r)$ is equivalent to $(p \vee \neg q \vee r)$. Given this information, there are 2 possible truth tables for the boolean logical operator ?. List, with proof, both of these truth tables.