CSCI 241:
HOMEWORK 1

Each question is worth 25 points. The assignment is due on Jan 28, in class. Show your work.

1. Construct a truth table for the below propopsitions.
   (a) $(q \rightarrow \neg p) \vee (\neg p \rightarrow \neg q)$
   (b) $p \rightarrow \neg p$
   (c) $p \leftrightarrow \neg q$
   (d) $(p \wedge q) \rightarrow (p \vee q)$
   (e) $(p \wedge q) \rightarrow \neg r$
2. Is $(\neg p \wedge (p \rightarrow q)) \rightarrow q$ always true, regardless of the values of p and q? Prove without using a truth table. Hint: Simplify as we did in class, and, when it is simple enough, either it should be T, or you should be able to easily see an assignment of truth values to p and q that will make the formula evaluate to F.
3. Show that $p \leftrightarrow q$ is equivalent to $q \leftrightarrow p$ without using truth tables.
4. Show that $(p \wedge q) \rightarrow r$ and $(p \rightarrow r) \wedge (q \rightarrow r)$ are not equivalent. Hint: can you find an assignment of values such that the two expressions evaluate to different values? After you do that, give some example sentences which would illustrate this non-equivalency. For instance, if I wanted to show that $p \rightarrow q$ is not the same as $q \rightarrow p$, I would say: Let p be "a is divisible by 6" and q be "a is divisible by 3." Clearly p implies q but not vice versa.