CSCI 2824 Discrete Structures
Instructor: Hoenigman
Assignment 2
Due Thursday, September 12, at the beginning of class

Problems (20pts each):

1. Use the letter s to represent the statement "Chris likes to play soccer", the letter r for "Chris likes to read", and p for "Chris likes to eat pizza". Write each of the following English sentences in propositional logic notation:
    a. Chris likes pizza but he does not like soccer.
    b. Chris likes to read and eat pizza, or he likes to play soccer.
    c. Chris does not like to eat pizza, but he likes to play soccer or read.
    d. Chris likes to do two of these things but not all three.
2. Use truth tables to check if each of these pairs of propositional logic statements are logically equivalent.
    a. $(p \vee q) \wedge (\neg p \vee q)$ and q
    b. $p \wedge (q \vee r)$ and $(p \wedge q) \vee r$
3. Let p and q be the propositions "Swimming at the New Jersey shore is allowed" and "Sharks have been spotted near the shore", respectively. Express each of these compound propositions as an English sentence.
    a. $\neg q$
    b. $\neg q \rightarrow p$
    c. $\neg p \rightarrow \neg q$
    d. $\neg p \wedge (p \vee \neg q)$
4. Four friends have been identified as suspects for an unauthorized access into a computer system. They have made statements to the investigating authorities. Alice said, "Carlos did it". John said, "I did not do it". Carlos said, "Diana did it". Diana said, "Carlos lied when he said that I did it".
    a. If the authorities know that exactly one of the four suspects is telling the truth, who did it? Explain your reasoning.

5. For this problem, use these predicates:

    $parentOf(x, y)$ means "x is a parent of y"
    $siblingOf(x, y)$ means "x is a sibling of y"

    Write the following statements in logic:
    1. John and Mary are the parents of Jeb.
    2. Lily and Mortimer are siblings
    3. Either John and Joe are siblings or John is Joe's parent.