Discrete Structures, Fall 2013, Homework 1

You must write the solutions to these problems legibly on your own paper, with the problems in sequential order, and with all sheets stapled together.

1. Convert the following sentences to logical statements assuming that "r", "s" and "t" represent the propositions below. (Assume Randy, Sally, and Tommy are the only three people we care about for this problem.)

   $j = $ "Randy likes to play soccer."
   $k = $ "Sally likes to play soccer."
   $m = $ "Tommy likes to play soccer."

   (a) Nobody likes to play soccer except Sally.
   (b) Randy likes to play soccer, and either Sally or Tommy likes to play soccer as well, but not both of them.
   (c) Randy likes to play soccer, and at least one of Sally or Tommy likes to play soccer, too.

2. For each of the sentences below, determine if the sentence is a statement. If the sentence is a statement, tell whether it is true or false.

   (a) What is the airspeed velocity of an unladen swallow?
   (b) This statement refers to itself.
   (c) This statement does not refer to itself.
   (d) This statement is false.

3. Express the negations of the following statements in normal English sentences.

   (a) I am wearing neither a hat nor a coat.
   (b) I am wearing either a scarf or gloves (or maybe both).

4. For each of the following statements, give the contrapositive, converse, and inverse statements (label them) in normal English, using the syntax "If ..., then ..." You may change verb tenses to improve the grammar.

   (a) If I forget to set my alarm, I will be late for class.
   (b) I will pass this class if I study hard.
   (c) You can go to the Justin Bieber concert only if you eat your vegetables.

5. Let x and y be statements. Construct a complete truth table for the statement $(x \rightarrow y) \wedge (y \rightarrow \sim x)$.

6. Let r, s, and t be statements. Construct a complete truth table for the statement $(r \vee s) \rightarrow (\sim s \wedge t)$.

1