Discrete Structures, Spring 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 "j", "k" and "m" represent the propositions below. (Assume Jane, Kyle, and Mary are the only three people we care about for this problem.)

   $j =$ "Jane likes to swim."
   $k =$ "Kyle likes to swim."
   $m =$ "Mary likes to swim."

   (a) Nobody likes to swim.
   (b) Nobody except Mary likes to swim.
   (c) Somebody in addition to Mary likes to swim.

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) How high is that?
   (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 have either CS2 or discrete math tomorrow (or both).
   (b) This hotdog is not tasty and it cost more than five dollars.

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 people turn to look at you on the street, you are not well dressed.
   (b) The Ab-Blaster can be yours if you pay us $500.
   (c) I eat oatmeal for breakfast only if the day of the week ends in "y."

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

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