CMSC250, Spring 2004 — Homework 1

Due Wednesday, February 4 at the beginning of your discussion section.

You must write the solutions to the problems single-sided on your own lined paper, with all sheets stapled together, and with all answers written in sequential order or you will lose points.

1. Use the following propositions for this problem.

   - b = "John is a basketball player."
   - h = "John is a hard worker."
   - c = "John is a computer science major."

   Write each of the following statements in symbolic form using the symbols $\sim$, $\wedge$, and $\vee$ and the letters defined above.

   (a) John is a basketball player, however he is not a computer science major.
   (b) John is either a hard worker or a basketball player, but not both.
   (c) John is a hard worker, but he is neither a basketball player nor a computer science major.

2. Use DeMorgan's Laws to write the negations of the following as English sentences.

   (a) Mary and Sam are both engineering majors.
   (b) Morgan is is neither a swimmer nor a runner.
   (c) Either the weather is nice or the game is cancelled.

3. Assuming x is a particular real number,

   (a) write the negation of this statement: $-1 < x \leq 4$.
   (b) Give one possible value that x could be if the statement "$-1 < x \leq 4$" is false.

4. State whether each of the following sentences are statements. If a sentence is a statement, state whether it is true or false.

   (a) "Why is the sky blue?"
   (b) "My CMSC250 instructor is Jan Plane."
   (c) "This sentence is not a statement."
   (d) "This sentence is both true and false."

5. Construct a complete truth table for each of the following statements, and tell whether each is a tautology, contradiction, or neither.

   (a) $(p \wedge \sim q) \wedge (\sim p \vee q)$
   (b) $\sim p \wedge (q \vee \sim r)$
   (c) $(p \wedge \sim q) \vee (p \wedge q) \vee \sim p$