CMSC 250 Fall 2004 — Homework 2

Due Wed., Sept. 15 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. For each of the following statements, give its converse, inverse, and contrapositive in English sentences; be sure to label the three parts of each answer. You may change verb tenses to make your answers sound better.

   (a) If people turn to look at you on the street, you are not well dressed.

   (b) If you want anything done well, do it yourself.

   (c) If you're not part of the solution, you're part of the precipitate.

   (d) The gift of grace can be yours only if you'll reach out and take it.

2. Construct a complete truth table to help you determine if the following argument is valid or not. State whether it is valid or not, indicate the entries in the truth table that led you to your answer, and explain why those entries support your answer.

$$\begin{array}{l} \sim p \vee q \\ r \rightarrow (\sim q) \\ \hline \therefore \;\; p \rightarrow (\sim r) \end{array}$$

3. This question allows you to practice two different ways that will verify that the following two statements are logically equivalent.

   - $P \leftrightarrow Q$
   - $(Q \wedge P) \vee \sim (P \vee Q)$

   (a) Construct a Complete Truth Table to show that the following two statements above are logically equivalent (they are indeed logically equivalent).

   (b) Next use only the rules given in table 1.1.1 along with definitions of biconditional and conditional as presented on the reference sheet to show that they are logically equivalent. Use the format of the proof shown in class — each line of your proof must be justified with one of the rules from table 1.1.1 and you must tell which line that rule was applied to get the new line you are adding to your proof.

4. Use any of the rules you were given to complete the two proofs below. Use the same format as was shown in class for these proofs — each line of your proof must be justified with the rule and line numbers you used to obtain that line.

(a)		(b)	
P1	$(p \rightarrow q) \wedge (r \rightarrow s)$	P1	$p \rightarrow q$
P2	$(s \wedge q) \rightarrow (\sim v)$	P2	$\sim q \vee r$
P3	v	P3	$s \vee (v \wedge \sim r)$
$\therefore$	$(\sim p) \vee (\sim r)$	$\therefore$	$\sim s \rightarrow \sim (p \vee \sim v)$