CMSC 250 Homework 1 ANSWERS Spring 2006

Due Wed Feb 1 at the beginning of your discussion section.

1. Convert the following sentences to logical expressions.

   (a) $j \vee k \vee l$

   (b) $(j \wedge k) \wedge \sim l$

   (c) $j \vee k$

2. Determine which of the following are statements and which are not.

   (a) Is a Statement.

   (b) Is a Statement.

   (c) Is a Statement.

   (d) Is NOT a Statement.

   (e) Is a Statement.

3. If the first column is known to be true, what else would need to be true in order to ensure that the second column is true?

   (a) q must also be true

   (b) nothing further is needed

   (c) q must be false

   (d) q must be false

4. Let a and b be statements. Construct the complete truth table for the following statement: $(a \vee b) \wedge (\sim a \vee \sim (a \vee b))$

a	b	c	$a \vee b$	$\sim a$	$\sim (a \vee b$	$\sim a \vee \sim (a \vee b)$	$(a \vee b) \wedge (\sim a \vee \sim (a \vee b))$
1	1	1	1	0	0	0	0
1	1	0	1	0	0	0	0
1	0	1	1	0	0	0	0
1	0	0	1	0	0	0	0
0	1	1	1	1	0	1	1
0	1	0	1	1	0	1	1
0	0	1	0	1	1	1	0
0	0	0	0	1	1	1	0

5. Let p, q, and r be statements. Construct the complete truth table for the following statement: $(\sim p \wedge q) \vee \sim r) \wedge p$

p	q	r	$\sim p$	$\sim r$	$\sim p \wedge q$	$(\sim p \wedge q) \vee \sim r$	$((\sim p \wedge q) \vee \sim r) \wedge p$
1	1	1	0	0	0	0	0
1	1	0	0	1	0	1	1
1	0	1	0	0	0	0	0
1	0	0	0	1	0	1	1
0	1	1	1	0	1	1	0
0	1	0	1	1	1	1	0
0	0	1	1	0	0	0	0
0	0	0	1	1	0	1	0

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

x	y	$\sim x$	$\sim y$	$y \vee \sim x$	$\sim x \wedge \sim y$	$(y \vee \sim x) \vee (\sim x \wedge \sim y)$	$((y \vee \sim x) \vee (\sim x \wedge \sim y)) \wedge x$
1	1	0	0	1	0	1	1
1	0	0	1	0	0	0	0
0	1	1	0	1	0	1	0
0	0	1	1	1	1	1	0