CSE 311 Quiz Section: April 4, 2013 (Solutions)

1. A Logic Problem: Knights and Knaves

You are on an island of knights and knaves. Knights always tell the truth and knaves always lie. You encounter two people, A and B. Determine, if possible, what the two people are in each of the problems below.
**Note: Each problem below is separate from the others, don't put them all together and try to solve or it will get way too complicated!

(1) A says, "At least one of us is a knave" and B says nothing.
Solution: A is a knight and B is a knave.
(2) A says, "The two of us are both knights" and B says, "A is a knave."
Solution: A is a knave and B is a knight.
(3) A says, "I am a knave or B is a knight" and B says nothing.
Solution: Both are knights.
(4) Both A and B say "I am a knight."
Solution: Undeterminable.

2. Implication Statements

Express each of these statements in the form "if p, then q" in English.

(1) It snows whenever the wind blows from the northeast.
Solution: If the wind blows from the northeast, then it snows.
(2) The apple trees will bloom if it stays warm for a week.
Solution: If it stays warm for a week, then the apple trees will bloom.
(3) That the Clippers win the championship implies that they beat the Lakers.
Solution: If the Clippers win the championship, then they must have beat the Lakers.
(4) It is necessary to walk 8 miles to get to the top of Long's Peak.
Solution: If you are at the top of Long's Peak, then you must have walked 8 miles.
(5) To get tenure as a professor, it is sufficient to be world-famous.
Solution: If you are world-famous, then you can get tenure as a professor.
(6) Your guarantee is good only if you bought your CD player less than 90 days ago.
Solution: If your guarantee is good, then you must have bought your CD player less than 90 days ago.

For the last one:
Some students thought the implication goes the opposite way. Any easy way to see why that is not the case is the following: Suppose that for your guarantee to be good, you must fulfill a set of conditions. One of them is the 90 days condition. For the sake of the argument, suppose that the other one is that you must be at least 25 years old. Then notice that the fact that you bought your CD player less than 90 days ago does not suffice for your guarantee to be good. On the other hand, if your guar-
antee is good the it must mean that you bought the CD player at most 90 days ago.

3. Verifying Logical Equivalences

Use a truth table to verify the distributive law: $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$.
Solution:

p	q	r	q v r	p ^ (q v r)	p ^ q	p ^ r	(p ^ q) v (p ^ r)
T	T	T	T	T	T	T	T
T	T	F	T	T	T	F	T
T	F	T	T	T	F	T	T
T	F	F	F	F	F	F	F
F	T	T	T	F	F	F	F
F	T	F	T	F	F	F	F
F	F	T	T	F	F	F	F
F	F	F	F	F	F	F	F