HW 3: due Monday, October 1

Reminder: No class on Wed, Sept 26 for Yom Kippur.

Part I:

A. Does the conclusion follow? Justify your answer by writing the argument down formally and using the rules of inference. I am a famous basketball player. Famous basketball players make lots of money. If I make lots of money, then you do what I say. I say you should buy sneakers that blink. Therefore, you should buy sneakers that blink

B. Consider the following hypotheses: If I take the bus or the subway, then I will be late for my appointment. If I take a cab, then I will not be late for my appointment, and I will be broke. I will be on time for my appointment. Which conclusions must follow, i.e. can be inferred from the hypothesis? Justify your answers.

1. I will take a cab.
2. I will be broke
3. I will not take the subway
4. If I become broke, then I took a cab
5. If I take the bus, then I won’t be broke

From Rosen do problems:
Section 1.4 (pp. 53-55): 12, 14, 18, 33ace, 61
Section 1.5 (pp.22-23): 9acei, 17ab, 30ad,

Part III (challenging):

A set $S$ of logical connectives is called universal if for any statement using all the connectives we know (i.e. \{ ¬, ∨, ∧, →, ↔, ⊕ \}) there is a logically equivalent statement using only the connectives in $S$. 
1. Prove or disprove: The set \{\neg, \lor, \land\} is universal

2. Prove or disprove: The set \{\neg, \lor\} is universal

3. Prove or disprove: The set \{\neg, \rightarrow\} is universal

4. Prove or disprove: The set \{\neg, \leftrightarrow\} is universal

5. Let \mid be a new logical connective defined as \(A \mid B\) is false when \(A\) and \(B\) are both true, and otherwise \(A \mid B\) is true.
   
   (a) Write down the truth table for \(A \mid B\).
   
   (b) Can you find an expression using only the variable \(P\) and the binary connective \(|\) that is equivalent to \(\neg P\)?

6. Prove or disprove: The smallest universal set \(S\) has size 2. (Hint: use previous problem).