Practice midterm

What follows are some problems which are *similar* to some which will appear on your exam. This list is far from exhaustive, in particular problems from chapter 3 are mosty missing because I want you to focus on your homework. Make sure to study your homework, the worksheets, and the class notes for other examples which may appear on the exam. Also study the 'definitions' supplement.

1. Write the truth table for the proposition $[P \wedge Q] \Rightarrow [P \Leftrightarrow Q]$.
2. Negate the proposition: for all real numbers $\epsilon > 0$ there exists a real number $\delta > 0$ so that for all real numbers x, $|x| < \delta$ implies $|\ln x| < \epsilon$.
3. Negate the proposition: for all real numbers $\epsilon > 0$ there exists a *unique* real number $\delta > 0$ so that for all real numbers x, $|x| < \delta$ implies $|\ln x| < \epsilon$.
4. Prove or give a counterexample: if a divides b and a divides b, then a divides $b + c$.
5. Prove or give a counterexample: for all real numbers $\epsilon > 0$, there exists a natural number N so that $1/\ln(N) < \epsilon$.
6. Prove or give a counterexample: for all real numbers $\epsilon > 0$, there exists a natural number N so that $\sqrt[10]{N} < \epsilon$.
7. Let A, B and C be sets. Prove $A \subseteq B$ iff $\mathcal{P}(A) \subseteq \mathcal{P}(B)$.
8. Let A and B be sets. Prove $(A \cup B)^c = A^c \cap B^c$.
9. State the principle of mathematical induction.
10. Prove by induction $1 \cdot 1! + 2 \cdot 2! + \cdots n \cdot n! = (n + 1)! - 1$.
11. Let $S \subseteq A \times B$, and $R \subseteq B \times C$. Prove $(R \circ S)^{-1} = S^{-1} \circ R^{-1}$.

Note: some things that WON'T be on exam:

1. Generalized mathematical induction (where the base step is not $n = 1$).
2. Infinite set families (on the exam we will only deal with finitely many sets at a time).