Assignment#2 – CECS 228   
  
1. For each of these arguments, explain which rules of inference are used for each step.

a) “Doug, a student in this class, knows how to write programs in JAVA. Everyone who knows how to write programs in JAVA can get a high-paying job. Therefore, someone in this class can get a high-paying job.”

b) “Somebody in this class enjoys whale watching. Every person who enjoys whale watching cares about ocean pollution. Therefore, there is a person in this class who cares about ocean pollution.”

c) “Each of the 93 students in this class owns a personal computer. Everyone who owns a personal computer can use a word processing program. Therefore, Zeke, a student in this class, can use a word processing program.”

d) “Everyone in New Jersey lives within 50 miles of the ocean. Someone in New Jersey has never seen the ocean. Therefore, someone who lives within 50 miles of the ocean has never seen the ocean.”  
  
2. Determine whether each of these arguments is valid. If an argument is correct, what rule of inference is being used? If it is not, what logical error occurs?

a) If n is a real number such that n > 1, then n2 > 1. Suppose that n2 > 1. Then n > 1.

b) If n is a real number with n > 3, then n2 > 9. Suppose that n2 ≤ 9. Then n ≤ 3.

c) If n is a real number with n > 2, then n2 > 4. Suppose that n ≤ 2. Then n2 ≤ 4.

3. Determine whether this argument, taken from Kalish and Montague [KaMo64], is valid.

If Superman were able and willing to prevent evil, he would do so. If Superman were unable to prevent evil, he would be impotent; if he were unwilling to prevent evil, he would be malevolent. Superman does not prevent evil. If Superman exists, he is neither impotent nor malevolent. Therefore, Superman does not exist.

4. Prove that if *n* is an integer and 3*n* + 2 is even, then *n* is even using   
**a)** a proof by contraposition.

**b)** a proof by contradiction.

5. Find a counterexample to the statement that every positive integer can be written as the sum of the squares of three integers.  
  
6. Show that at least three of any 25 days chosen must fall in the same month of the year using proof by contradiction.  
  
7. Use a direct proof to show that every odd integer is the difference of two squares.  
  
8. Prove that there are no positive perfect cubes less than 1000 that are the sum of the cubes of two positive integers.  
  
9. Prove or disprove that if you have an 8-gallon jug of water and two empty jugs with capacities of 5 gallons and 3 gallons, respectively, then you can measure 4 gallons by successively pouring some of or all of the water in a jug into another jug.

10. Use forward reasoning to show that if *x* is a nonzero real number, then *x*2 + 1*/x*2 ≥ 2. [*Hint:* Start with the inequality *(x* − 1*/x)*2 ≥ 0 which holds for all nonzero real numbers *x*.]