EE2302 Foundations of Information Engineering

Assignment 1 **Due: 6 pm, Sep 8 (Thu)**

Full mark: 16 points

1. (2 points) Prove or disprove that the sum of any even integer and any odd integer is odd.

2. (3 points) A prime number is an integer greater than 1 whose only factors are 1 and itself. Consider the following statement: If a number is prime, then the number is either odd or 2. Prove it by *contraposition*.
   - Hint: $\sim(p \vee q) \equiv \sim p \wedge \sim q$, i.e., NOT (p or q) is equivalent to (NOT p) AND (NOT q).

3. (3 points) Let $C = \{n \in Z \mid n = 9^r \text{ for some integer } r\}$,
   $D = \{m \in Z \mid m = 3^s \text{ for some integer } s\}$.
   Prove or disprove each of the following statements:
   a) $C \subseteq D$;
   b) $D \subseteq C$.

4. (3 points) Let $B = \{y \in \mathbb{Z} | y = 10b - 4 \text{ for some integer } b\}$,
   $C = \{z \in \mathbb{Z} | z = 10c + 6 \text{ for some integer } c\}$.
   Is $B = C$? Prove or disprove it.

5. (2 marks) Let n be the smallest integer not describable in fewer than twelve English words. Is n well defined? Explain your answer.

6. (3 points) Can there exist a computer program that has as output a list of all the computer programs that do not list themselves in their output? Explain your answer.