1. (50 points) Consider the following formal language:
   - The alphabet consists of two symbols: 0 and 1
   - Admissible words consists of finite sequences of 0’s and 1’s that start with 1.
   - Grammatically correct sentences consists of admissible words, and no more.

   (a) Decide if the following are admissible sentences in this language. Briefly explain your answer:
      - “0011”
      - “1001”

   (b) We introduce a truth value evaluation scheme to our language by stating that every sentence that contains exactly three 1’s is TRUE, otherwise it is FALSE. Decide if the following sentences are true propositions, false propositions, or not a proposition.
      - “11000”
      - “101010”
      - “001100”

   (c) Consider the predicate

   \[ P(x) : \text{“11} x 001” \]

   Decide if the following propositions are TRUE or FALSE, and briefly explain your answer:
      - \( \forall x \ P(x) \)
      - \( \exists x \ P(x) \)
2. (50 points)  (a) Write the elements of the following sets: 

$$A = \{ x \mid x \text{ is an even integer less than 23} \}$$

$$B = \{ x \mid x \text{ is an odd integer less than 8} \}$$

(b) Write the elements of the set $A \cup B$.

(c) Write the elements of the set $A \cap B^c$