1. (a) Prove that \( T = \{8n - 7 \mid n \in \mathbb{Z}\} \) is not a subset of \( 3\mathbb{Z} \).
    (b) Prove that \( T \) is a subset of the set \( S \) of odd integers.

2. Let \( M = \{10a + 15b + 18c \mid a, b, c \in \mathbb{Z}\} \). Prove that \( M = \mathbb{Z} \).

3. Let \( A, B, \) and \( C \) be sets with universal set \( U \). Prove:
   (a) \((A \setminus B) \setminus C = A \setminus (B \cup C)\)
   (b) \((A \cap C) \times B = (A \times B) \cap (C \times B)\)
   (c) \(A^c \times B^c \subseteq (A \times B)^c\), but that these sets are not equal.

4. Let \( A \) and \( B \) be sets. Prove that \([\mathcal{P}(A) \cup \mathcal{P}(B)] \subseteq \mathcal{P}(A \cup B)\) but that these sets are not equal.