2.1 and 2.2 Sets - Worksheet

1. Write the set $\{x \mid x \in \mathbb{R},\ x^2 = 4 \vee x^2 = 9\}$ in list form.

2. Let $S = \{\emptyset, a, \{a\}\}$. Determine whether each of these is an element of S, a subset of S, neither, or both.

   (a) $\{a\}$

   (b) $\{\{a\}\}$

   (c) $\emptyset$

   (d) $\{\{\emptyset\}, a\}$

   (e) $\{\emptyset\}$

   (f) $\{\emptyset, a\}$

3. Let $A = \{a, b, c, d, e\}$ and $B = \{a, b, c, d, e, f, g, h\}$. Find

   (a) $A \cup B$

   (b) $A \cap B$

   (c) $A - B$

   (d) $B - A$

4. Show that if A, B, and C are sets, then $\overline{A \cap B \cap C} = \overline{A} \cup \overline{B} \cup \overline{C}$ by using a membership table.

5. Draw the Venn diagrams for each of these combinations of the sets A, B, and C.

   (a) $A \cap (B \cup C)$

   (b) $\overline{A} \cap \overline{B} \cap \overline{C}$

   (c) $(A - B) \cup (A - C) \cup (B - C)$

6. Suppose that the universal set is $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Express each of these sets with bit strings where the ith bit in the string is 1 if i is in the set and 0 otherwise.

   (a) $\{3, 4, 5\}$

   (b) $\{1, 3, 6, 10\}$

   (c) $\{2, 3, 4, 7, 8, 9\}$