

Show your work.

Section 2.1

4. For each of these pairs of sets, determine whether the first is a subset of the second, the second is a subset of the first, or neither is a subset of the other.

- a) the set of people who speak English, the set of people who speak English with an Australian accent
- b) the set of fruits, the set of citrus fruits
- c) the set of students studying discrete mathematics, the set of students studying data structures

14. Use a Venn diagram to illustrate the relationship $A \subseteq B$ and $B \subseteq C$.

32. Let $A = \{a, b\}$, $B = \{x, y\}$, and $C = \{0, 1\}$. Find

- a) $A \times B \times C$
- b) $C \times B \times A$
- c) $C \times A \times B$
- d) $B \times B \times B$

42. Translate each of these quantifications into English and determine its truth value.

- a) $\exists x \in \mathbf{R} (x^3 = -1)$
- b) $\exists x \in \mathbf{Z} (x + 1 > x)$
- c) $\forall x \in \mathbf{Z} (x - 1 \in \mathbf{Z})$
- d) $\forall x \in \mathbf{Z} (x^2 \in \mathbf{Z})$

Section 2.2

2. Suppose that A is the set of sophomores at your school and B is the set of students in discrete mathematics at your school. Express each of these sets in terms of A and B .

- a) the set of sophomores taking discrete mathematics in your school
- b) the set of sophomores at your school who are not taking discrete mathematics
- c) the set of students at your school who either are sophomores or are taking discrete mathematics
- d) the set of students at your school who either are not sophomores or are not taking discrete mathematics

4. 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) $B - A$

12. Prove the first absorption law from Table 1 by showing that if A and B are sets, then $A \cup (A \cap B) = A$.

24. Let A , B , and C be sets. Show that $(A - B) - C = (A - C) - (B - C)$.

52. 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 i th 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) $\{2, 3, 4, 7, 8, 9\}$