2.1.2 (a, b, c, e, h)

a) False

b) True

c) True

e) False

h) True

2.1.5 (a, b)

a) $A = \{x \in \mathbb{Z} : -2 \leq x \leq 2\}$
Cardinality: $|A| = 5$

b) $B = \{x \in \mathbb{Z}^+ : x \text{ is a positive integer divisible by } 3\}$
Set is Infinite

2.2.2 (b)

b) $P(B) = \{\varnothing, \{1\}, \{2\}, \{1, 2\}\}$

2.2.4 (b)

b) $X = \{2\}$ or $X = \{1, 2\}$ or $X = \{2, 3\}$ or $X = \{1, 2, 3\}$

2.2.5 (a, c, d, e)

a) **True.** Empty set is an element of any power set.

c) **Not enough info.** We don't know if P(X) only contains $\varnothing$, or $\varnothing$ with additional sets. We know $\varnothing$ is a subset of any power set but in this case we don't yet know if it's a *proper* subset.

d) **Not enough info.** We don't know if P(X) has an element $\{\varnothing\}$ (a set with the empty set in it which is not the same as just $\varnothing$).

e) **False.** Even though we don't know the exact size of X, we know that the Cardinality of power sets must be a power of 2. 17 is *not* a power of 2.

2.3.1 (d, e, g)

d) {-5, -3, 0, 1, 4, 17}

e) {1}

g) {-5, -3, 1, 17}

2.3.4

a) {∅, {b} }

b) {∅, {a}, {b}, {c}, {a, b}, {a, c}, {b, c}, {a, b, c} }

c) {∅, {b} }

d) {∅, {a}, {b}, {c}, {a, b}, {b, c} }

2.4.2 (a, b)

a) {1, 5, 6, 7}

b) $A \oplus B \oplus C$ contain elements which occur only once in any of the three sets and that occur in all three sets.

2.4.5

a) A

b) ∅

c) Not enough information given.

d) A

e) Not enough information given.

2.5.2 (b, f)

b) $(B \cup A) \cap (\overline{B} \cup A) = A$

Commutative Law (x2)
$(A \cup B) \cap (A \cup \overline{B})$

Distributive Law
$A \cup (B \cap \overline{B})$

Complement Law
$A \cup \varnothing$

Identity Law and **Final Answer**
A

f) $A \cap (B \cap \overline{B}) = \varnothing$

Complement Law
$A \cap \varnothing$

Domination Law and **Final Answer**
$\varnothing$

2.5.4 (a)

a) $A - (B \cap A) = A - B$

Subtraction Law
$A \cap (\overline{B \cap A})$

De Morgan's Law
$A \cap (\overline{B} \cup \overline{A})$

Commutative Law
$A \cap (\overline{A} \cup \overline{B})$

Distributive Law
$(A \cap \overline{A}) \cup (A \cap \overline{B})$

Complement Law
$\varnothing \cup (A \cap \overline{B})$

Identity Law
$(A \cap \overline{B})$

Subtraction Law and **Final Answer**
A - B

2.6.3 (a, c, e)

a) False

c) True

e) True

2.6.4

a) {++, --, +-, -+}

b) {000, 001, 010, 100, 011, 101, 110, 111}

2.6.5

a) $2^7 = 128$

b) $4^3 = 64$

2.7.3

a) **No**. Sets A, B, and C do not from a partition of the set $\mathbb{R}$ because they don't include -2 and 2, both of which are real numbers. Not covering the entire set of all real numbers disqualifies A, B, and C from being considered a partition of $\mathbb{R}$.

b) **Yes**.

c) **No**. Sets D and E intersect at element -2 which means these sets are *not* pairwise disjoint, disqualifying it from being a partition of $\mathbb{R}$.