Answers for some of the homework problems from sections 1.1-1.3

1.1.6.
(a) The election is not decided.
(b) The election is decided, or the votes have been counted.
(c) The election is not decided, and the votes have been counted.
(d) If the votes have been counted, then the election is decided.
(e) If the votes have been counted, then the election is not decided.
(f) If the election is not decided, then the votes have been counted.
(g) The election is decided if and only if the votes have been counted.
(h) Either the votes have been counted, or else the election is not decided
and the votes have been counted.

1.1.10.
(a) \( r \land \neg q \);
(b) \( p \land q \land r \);
(c) \( r \rightarrow p \);
(d) \( p \land \neg q \land r \);
(e) \( (p \land q) \rightarrow r \);
(f) \( r \leftrightarrow (q \lor p) \).

1.3.12.
(a) \( Q(0) \) is true.
(b) \( Q(-1) \) is true.
(c) \( Q(1) \) is false.
(d) True
(e) False
(f) True
(g) False

1.3.16.
(a) True
(b) False
(c) True
(d) False

1.3.20.
(a) \( P(-5) \lor P(-3) \lor P(-1) \lor P(1) \lor P(3) \lor P(5) \).
(b) \( P(-5) \land P(-3) \land P(-1) \land P(1) \land P(3) \land P(5) \).
(c) \( P(-5) \land P(-3) \land P(-1) \land P(3) \land P(5) \).
(d) \( P(1) \lor P(3) \lor P(5) \).
(e) \( (\neg P(1) \lor \neg P(3) \lor \neg P(5)) \land (P(-5) \land P(-3) \land P(-1)) \)

1.3.22. Let \( C(x) := "x \text{ is in your class}" \)
(a) Let \( P(x) := "x \text{ has a cellular phone}" \). We have \( \forall x \; P(x) \) the first way, or \( \forall x (C(x) \rightarrow P(x)) \) the second way.
(b) Let \( F(x) := "x \text{ has seen a foreign movie}" \). We have \( \exists x \; F(x) \) the first way, or \( \exists x (C(x) \land F(x)) \) the second way.
(c) Let \( S(x) := "x \text{ can swim}" \). We have \( \exists x \; \neg S(x) \) the first way, or \( \exists x (C(x) \land \neg S(x)) \) the second way.
(d) Let $Q(x) ::= \forall x$ can solve quadratic equations". We have $\forall x \ Q(x)$ the first way, or $\forall x (C(x) \rightarrow Q(x))$ the second way.

(e) Let $R(x) ::= \forall x$ wants to be rich". We have $\exists x \neg R(x)$ the first way, or $\exists x (C(x) \land \neg R(x))$ the second way.