1.6.2 (b)
True.
There exists an integer, -1, where -1 + 2 = 1.

1.6.3 (d)
$\forall x(x \leq x^2 + 1)$

1.6.4 (b)
This is true because within the predicate P(x), ‘a’ is True.

1.7.2 (a)
$\exists x(E(x) \land T(x))$

1.7.2 (d)
$\exists x(E(x) \land \neg T(x))$

1.7.4 (b)
$\forall x(\neg S(x) \land W(x))$

1.8.2 (a)
$\forall x D(x)$
$\neg \forall x D(x)$
$\exists x \neg D(x)$
There exists a patient who didn’t receive the medication.

1.8.2 (c)
$\exists x(D(x) \land M(x))$
$\neg \exists x(D(x) \land M(x))$
$\forall x \neg (D(x) \land M(x))$
$\forall x(\neg D(x) \lor \neg M(x))$
Every patient was either not given the medication or didn’t have a migraine.

1.9.3 (b)
True.
X could be 0, and there’s no real number Y that can make xy = 0 false.

1.9.3 (d)
False.
If X can be any number, it doesn’t matter what number Y chooses to be because Z can be any number, including an incorrect number.

1.9.4 (c)
Start:
$\exists x\forall y(P(x, y) \rightarrow Q(x, y))$
Add negation:
$\neg\exists x\forall y(P(x, y) \rightarrow Q(x, y))$

De Morgan's Law
$\forall x\neg\forall y(P(x, y) \rightarrow Q(x, y))$

De Morgan's Law
$\forall x\exists y\neg(P(x, y) \rightarrow Q(x, y))$

Conditional Identity
$\forall x\exists y\neg(\neg P(x, y) \lor Q(x, y))$

De Morgan's Law
$\forall x\exists y(\neg\neg P(x, y) \lor \neg Q(x, y))$

Double Negation Law and **Final Answer** for 1.9.4 (c)
$\forall x\exists y(P(x, y) \lor \neg Q(x, y))$

1.9.4 (e)
Start:
$\exists x\exists y(P(x, y) \land \forall x\forall yQ(x, y))$
Add negation:
$\neg\exists x\exists y(P(x, y) \land \forall x\forall yQ(x, y))$

De Morgan's Law
$\forall x\neg\exists y(P(x, y) \land \forall x\forall yQ(x, y))$

De Morgan's Law
$\forall x\forall x\neg(P(x, y) \land \forall x\forall yQ(x, y))$

De Morgan's Law
$\forall x\forall x(\neg P(x, y) \lor \neg\forall x\forall yQ(x, y))$

De Morgan's Law
$\forall x\forall x(\neg P(x, y) \lor \exists y\neg\forall yQ(x, y))$

De Morgan's Law and **Final Answer** for 1.9.4 (e)
$\forall x\forall x(\neg P(x, y) \lor \exists y\exists y\neg Q(x, y))$

1.10.2 (a)
True.
X can be any real number. Since Y can choose to be any number, then Y becomes -X so it equals 0.

1.10.2 (b)
False.
It doesn't matter what number X chooses to be. Y can be any number so that $Y \neq -X$, making $x + y = 0$ false.

1.10.4 (a)
$P(x, y)$ = The ratio of x and y is less than 1
$\exists x \exists y P(x, y)$

1.10.4 (c)
$S(x, y)$ = The sum of x and y is equal to the product of x and y.
$\exists x \exists y S(x, y)$