Rhea Mae Edwards
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Week 3 Problem Set:

Section 2.2: 3, 4, 16, 31, 47

#3

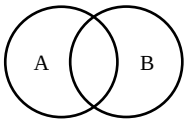
a. $A \cup B = \{0, 1, 2, 3, 4, 5, 6\}$
b. $A \cap B = \{3\}$
c. $A - B = \{1, 2, 4, 5\}$
d. $B - A = \{0, 6\}$

#4

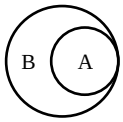
a. $A \cup B = \{a, b, c, d, e, f, g, h\}$
b. $A \cap B = \{a, b, c, d, e\}$
c. $A - B = \{\emptyset\}$
d. $B - A = \{f, g, h\}$

#16

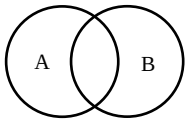
a. $(A \cap B) \subseteq A$



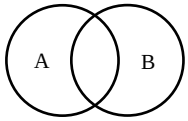
b. $A \subseteq (A \cup B)$



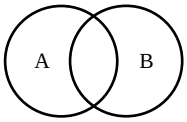
c. $A - B \subseteq A$



d. $A \cap (B - A) = \emptyset$



e. $A \cup (B - A) = A \cup B$



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#31

$A \subseteq B \equiv \forall x\,(x \in A \rightarrow x \in B) \equiv \forall x\,(x \notin B \rightarrow x \notin A) \equiv \forall x\,(x \in B' \rightarrow x \in A') \equiv B' \subseteq A'$

#47

a. $\bigcup_{i=1}^{n} A_i = \{1, 2, 3, \ldots, n\}$
b. $\bigcap_{i=1}^{n} A_i = \{1\}$

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Section 1.4: 1, 3, 8, 11, 12, 16, 21, 35, 36, 59

#1

a. True
b. True
c. False

#3

a. True
b. True
c. False
d. True

#8

a. All rabbits hop.
b. All animals are rabbits and hops.
c. There are rabbits that hop.
d. There are animals that are rabbits and hop.

#11

a. True
b. True
c. False
d. False
e. True
f. False

#12

a. False
b. True
c. False
d. True
e. False
f. True
g. False

#16

a. True
b. False
c. True
d. False

#21

a. Domain for which the statement is true: Students taking a discrete mathematics class the night right before the midterm.
   Domain for which that statement is false: Students who attend OSU.

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b. Domain for which the statement is true: People in bar that doesn't allow minors.
Domain for which that statement is false: Students who attend OSU.
c. Domain for which the statement is true: My sister and I.
Domain for which that statement is false: A graduation college class.
d. Domain for which the statement is true: The main cast of the Big Bang Theory television show.
Domain for which that statement is false: My family.

#35

a. There is no counterexample.
b. $x = 0$
c. $x = 0$

#36

a. $x = 1$
b. $x = \sqrt{2}$
c. $x = 0$

#59

a. $\forall x\ (P(x) \rightarrow \neg\ Q(x))$
b. $\forall x\ (Q(x) \rightarrow R(x))$
c. $\forall x\ (P(x) \rightarrow \neg\ R(x))$
d. Statement of (c) cannot be followed from (a) and (b), because there can be professors who are vain that are not ignorant.

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Section 1.5: 9, 16, 26, 27, 39, 40, 45, 46

#9

a. $\forall x\, L(x, Jerry)$
b. $\forall x\, \exists y\, L(x, y)$
c. $\exists y\, \forall x\, L(x, y)$
d. $\forall x\, \forall y\, \neg L(x, y)$
e. $\exists y\, \neg L(Lydia, y)$
f. $\exists y\, \forall x\, \neg L(x, y)$
g. $\exists y\, (\forall x\, L(x, y) \wedge \forall a\, ((\forall b\, L(a, b)) \rightarrow b = y))$
h. $\exists a\, \exists b\, (a \neq b \wedge L(Lynn, a) \wedge L(Lynn, b) \wedge \forall c\, (L(Lynn, c) \rightarrow (c = a \vee c = b)))$
i. $\forall x\, L(x, x)$
j. $\exists x\, \forall y\, (L(x, y) \leftrightarrow x = y)$

#16
F(x) = "x is a freshman"
S(x) = "x is a sophomore"
J(x) = "x is a junior"
G(x) = "x is a senior"
C(x) = "x is a computer science major"
M(x) = "s is a mathematics major"
Domain: Students in a certain discrete mathematics class

a. $\exists x\, J(x)$
   Truth Value: True
b. $\forall x\, C(x)$
   Truth Value: False
c. $\exists x\, \neg (M(x) \wedge J(x))$
   Truth Value: True
d. $\forall x\, (S(x) \vee C(x))$
   Truth Value: False
e. Out of the domain to produce/conclude.

#26

a. False
b. True
c. False
d. False
e. True
f. True
g. True
h. False
i. False

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#27

a. True
b. True
c. True
d. True
e. True
f. False
g. False
h. True
i. False

#39

a. $x = -1, y = 1$
b. $x = 1, y = 0$
c. $x = 1, y = -1$

#40

a. $x = 0, y = 1$
b. $x = 0, y = 11$
c. $x = 1, y = 1$

#45

a. True
b. False
c. True

#46

a. True
b. True
c. True