MT 112, Homework #2, Spring 2020 Name _____

Instructions: Work problems on a separate sheet of paper and attach work to this page. You should show all work to receive full credit for problems. Checking your work with computer algebra systems is fine, but that doesn't count as "work" since you won't be able to use CAS programs on exams or quizzes. Sketch any graphs you obtain. Questions with compact answers can be recorded directly on this page. Graphs and longer answers that won't fit here, indicate which page of the work the answer can be found on and be sure to clearly indicate it on the attached pages.

1. List all the elements of the indicated sets, and answer the questions that follow.
   a. Let A be the set of all the letters in the title ROMEO AND JULIET.
   b. Let B be the set of all the letters in the title JULIUS CAESAR.
   c. Find $A \cup B$.
   d. $|A| = n(A)$
   e. If U is the set of all letters in the English alphabet, what is B'?
   f. Find $A \cap B$.
   g. $|A \cap B| = n(A \cap B)$

2. List the numbers in the sets.
   a. $\{x | x \text{ is a real number such that } x^2 = 1\}$
   b. $\{x | x \text{ is a positive integer less than } 12\}$
   c. $\{x | x \text{ is the square of an integer and } x < 100\}$
   d. $\{x | x \text{ is an integer such that } x^2 = 2\}$

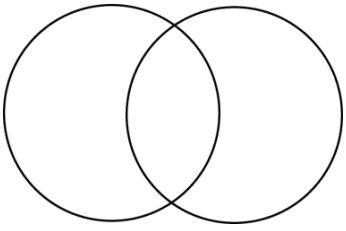
3. Let $Q = \{x | x \text{ is an even counting number less than } 20\}$ and let $R = \{x | \ x \text{ is an integer divisible by } 2\}$. Determine whether the following statements are true or false.
   a. $Q \in R$
   b. $-4 \in Q$
   c. $6 \subset Q$
   d. $Q \subset R$
   e. $6 \in R$
   f. $\{6\} \subset R$

4. Determine whether each of the following statements is true or false.
   a. $0 \notin \varnothing$
   b. $\{0\} \in \{0\}$
   c. $\varnothing \subseteq \{x\}$
   d. $\varnothing \in \{0\}$
   e. $\varnothing \subset \{0\}$

5. Let $A = \{1, 2, 3, 4, 5\}, B = \{0, 3, 6\}$. Find the following sets:
   a. $A \cup B$
   b. $A \cap B$

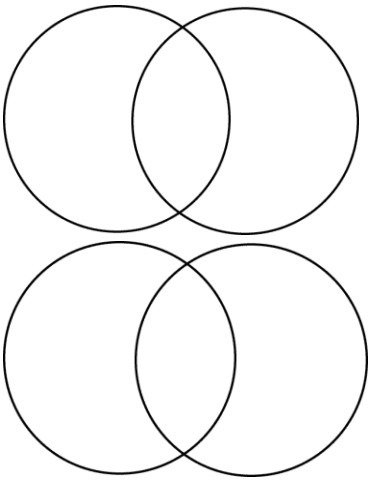
6. Use a Venn diagram to illustrate the relationship that $A \subset B$ and $B \subset C$.

7. Use the Venn Diagrams below to draw the indicated sets.

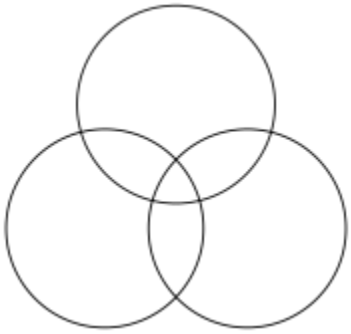


   a. $A' \cap B$

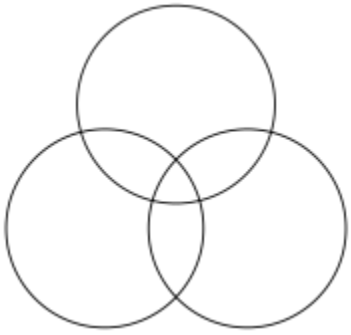
b. $B - A$



c. $(A \cap B) \cup (A \cup B)'$



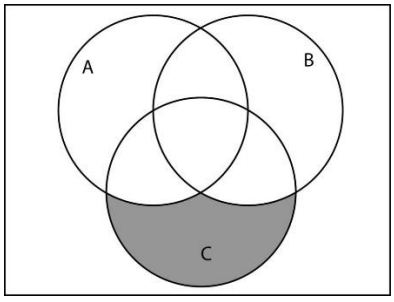
d. $(A' \cap B') \cup C$



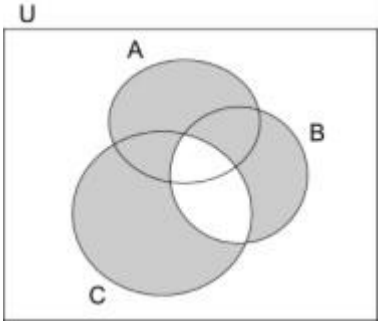
e. $(A \cap C') \cup B$

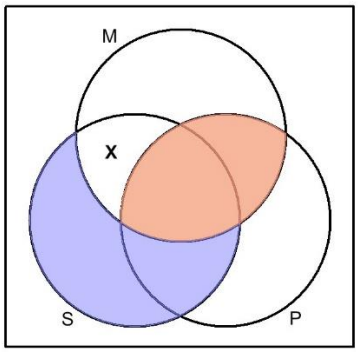
8. Write the set notation for the Venn diagrams below.

a.



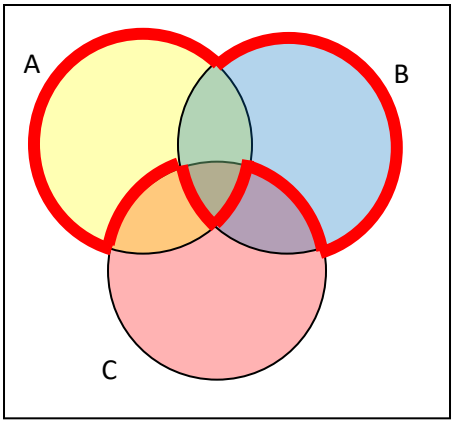
c.





b.

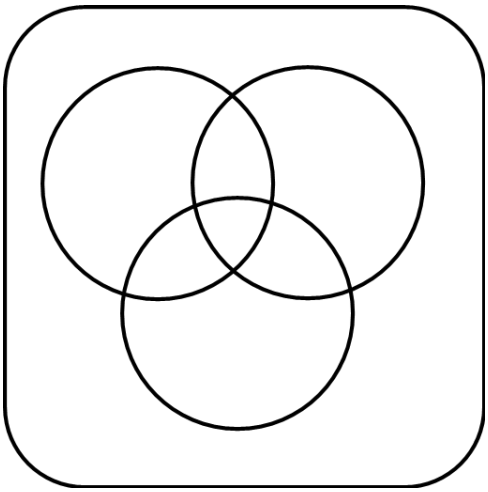
d.



9. If $A = \{a, b, c, d\}, and\ B = \{y, z\}, and\ C = \{0,1\}$:
   a. List all the elements of A×B. What is the cardinality of the resulting set?
   b. List all the elements of A×B×C. What is the cardinality of the resulting set?
   c. List all the elements of A^2 (i.e. $A \times A$).

10. Use the information below to fill in the Venn Diagram, then determine:
    a. How many students have seen exactly one of these movies?
    b. How many had seen only *Star Wars*?

    18 had seen *The Matrix* (*M*)
    24 had seen *Star Wars (SW)*
    20 had seen *Lord of the Rings (LotR)*
    10 had seen *M* and *SW*
    14 had seen *LotR* and *SW*
    12 had seen *M* and *LotR*
    6 had seen all three



11. 140 U.S. adults were surveyed about their beliefs in astrology (A), reincarnation (R), and spirituality of yoga (Y). The following results were obtained (in set notation): $n(A) = 35$, $n(R) = 36, n(Y) = 32, n(A \cap R) = 19, n(R \cap Y) = 8, n(A \cap Y) = 10, n(A \cap R \cap Y) = 6$. Draw a Venn Diagram to illustrate the results and then answer the following questions.
    a. How many believe in astrology but not reincarnation?
    b. How many people believe in exactly one of these things?
    c. How many believe in none of these things?