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MATH 2220
Quiz 1

1. (10 points) The sets A, B, C are the subsets of the universal set U , where:

- The universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
- $A = \{x : x \text{ is a positive even integer less than } 11\}$
- $B = \{x \in Z : 3 \leq x \leq 5\}$
- $C = \{x : x \text{ is a positive odd integer less than } 10\}$

(a) List all the elements of the following sets:

i. A

$$= \{2, 4, 6, 8, 10\}$$

ii. $B = \{3, 4, 5\}$

iii. $C = \{1, 3, 5, 7, 9\}$

iv. $A \cup B = \{2, 3, 4, 5, 6, 8, 10\}$

v. $C - B = \{1, 7, 9\}$

vi. $A \cap \bar{C} = \{2, 4, 6, 8, 10\}$

vii. $(A \cup C) \cap B = \{3, 4, 5\}$

viii. $B \times C = \{(3, 1), (3, 3), (3, 5), (3, 7), (3, 9), (4, 1), (4, 3), (4, 5), (4, 7), (4, 9), (5, 1), (5, 3), (5, 5), (5, 7), (5, 9)\}$

(b) What is $|P(B)|?$ $= 8$

(c) List all the subsets of B .

$$\{\emptyset, \{3\}, \{4\}, \{5\}, \{3, 4\}, \{3, 5\}, \{4, 5\}, \{3, 4, 5\}\}$$

2. (5 points) Let $A = \{1, 2, \{5, 8\}, 11\}$. Identify each of the followings as true or false:

a. $\{1, 2, 11\} \subseteq A$ b. $\{5\} \in A$ c. $\{1, 2, \{8\}, 5\} \subseteq A$

d. $\{\} \in A$ e. $\{5, 8\} \in A$

a. true b. false c. false

d. false e. true

3. (4 points) Pairs of set A and B are given.

(a) In each case, determine if $A = B$ or $A \neq B$:

i. $A = \{1, 2, 3\}$ $B = \{1, 2, 2, 3\}$

I. $A = B$

ii. $A = \{\phi, 3, 5, 9\}$ $B = \{\phi, 9, 3, 5\}$

II. $A = B$

iii. $A = \{n \mid n \in \mathbb{Z} \text{ and } n^2 < 1\}$ $B = \{n \mid n \in \mathbb{Z} \text{ and } n^2 < n\}$

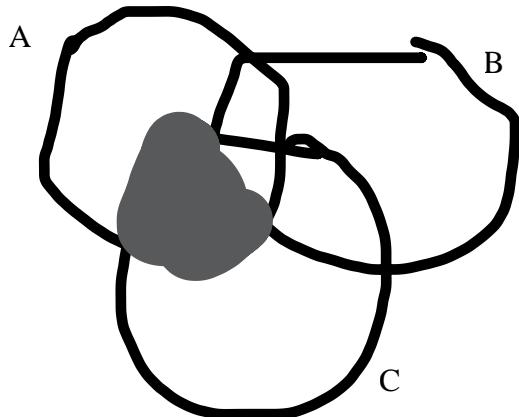
II. $A \neq B$

(b) Determine whether A implies B and vice versa:

$$A = \{n \mid n \in \mathbb{N} \text{ and } n \text{ is odd}\} \quad B = \{n \mid n \in \mathbb{N} \text{ and } n^2 \text{ is odd}\}$$

A implies B and B implies A .

4. (2 points) Draw the Venn Diagram that represents the expression: $(A - B) \cap (B \cup C)$.



5. (2 points) Let $A = \{+, *, -\}$. What is A^2 ? Express your answer as strings, not triplets (i.e., without the parentheses and commas).

$$A^2 = \{++, **, --, +*, +-, *-, *+, -+, -*\}$$

6. (2 points) Define the following sets:

- $A = \{1, 3, 6\}$
- $B = \{2, 4, 4\}$
- $C = \{5\}$
- $D = \{x \in \mathbb{Z} : 1 \leq x \leq 6\}$

Do A , B , and C form a partition of D ? If not, which condition of a partition is not satisfied?

$$D = A \cup B \cup C$$

A, B, and C do form a partition for D.