

Math 240

Name: Key

Date: 09/02/16

Quiz 1

Directions: You have 15 minutes to complete this quiz. Read each question carefully. No calculators are allowed.

1. (1 point) Describe the following set by listing its elements within braces.

$$\{m \in \mathbb{N} : -3 \leq m - 3 < 4\}$$

$$-3 \leq m - 3 < 4 \Rightarrow 0 \leq m < 7 \quad \text{recall } 0 \notin \mathbb{N}, \text{ so}$$

$$\text{the set is } \boxed{\{1, 2, 3, 4, 5, 6\}}$$

2. (1 point) Determine the cardinality of the set $\{\emptyset, 1, 2, 3, \{1, 2\}, 4, \{4\}\}$.

$$\text{cardinality equals } \boxed{7}$$

3. (5 points) Let $U = \{1, 2, 3\}$ be the universal set. Let

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

Determine the following sets by listing their elements within braces.

(a) $(A \cup B) - (B \cap C)$

$$= \{1, 2, 3\} - \{3\} = \boxed{\{1, 2\} = A}$$

(b) \overline{A}

$$\boxed{\{3\}}$$

(c) $\overline{B \cup C} = \overline{\{1, 2, 3\}} = \boxed{\{\} = \emptyset}$

(d) $\mathcal{P}(A) = \boxed{\{\emptyset, \{1\}, \{2\}, \{1, 2\}\}.$

(e) $A \times B = \boxed{\{(1, 2), (1, 3), (2, 2), (2, 3)\}}$

4. (3 points) Let $\mathbb{R}^+ = \{x \in \mathbb{R} \mid x > 0\}$, in other words, \mathbb{R}^+ is the set of all positive real numbers. Consider \mathbb{R}^+ as an indexing set, and define for each $x \in \mathbb{R}^+$ the set A_x by

$$A_x = (-x, x) = \{r \in \mathbb{R} \mid -x < r < x\}.$$

- (a) Describe the set $\bigcap_{x=1}^3 A_x$ using interval notation.

$$\begin{aligned} A_1 \cap A_2 \cap A_3 &= (-1, 1) \cap (-2, 2) \cap (-3, 3) \\ &= \boxed{(-1, 1)} \end{aligned}$$

- (b) Describe the set $\bigcap_{x \in \mathbb{R}^+} A_x$ by listing its elements within braces.

$\bigcap_{x \in \mathbb{R}^+} (-x, x)$ only contains the number 0

$$\text{So } \bigcap_{x \in \mathbb{R}^+} A_x = \boxed{\{0\}}$$