RUTGERS
UNIVERSITY | NEWARK

Math 237
Discrete Structures

Fall 2017

Quiz #1

Monday, September 18 2017

Duration: 20 min

NAME: ________________________

Please write clearly and properly.

Problem	**Grade**
1	
2	
3	
Total	

Problem 1 (~ 5 points.)**.** Give the answer to each of the following questions. *No explanations required.*

Consider the sets $R = \{1, 2, 5, 8\}$, $S = \{0, 2, 5\}$, and $T = \{2, 4, 8\}$.

(1) What is the set $R \cap S \cap T$?

(2) What is the set $(R \cap S) - T$?

(3) What is the cardinality of $\mathcal{P}(T)$?

(4) What is the cardinality of $(R \cap S) \times (R \cap T)$?

(5) What is the cardinality of $R \cap (S \times T)$?

Problem 2 (~ 5 points.)**.** True or False? *No explanations required.*

(1) For any sets A and B, $|A \cup B| = |A| + |B|$.

(2) For any sets A and B, $|A \cup B| = |A| + |B| - |A \cap B|$.

(3) For any sets A and B, $A \cap (A \cup B) = A$.

(4) $\mathbb{Z} \cap \{x \in \mathbb{R} \mid x^2 = 2\} = \emptyset$.

(5) There are two partitions of a set with two elements.

(6) If A and B are finite sets, then $A \times B$ is also finite.

(7) $\{0, \{1, 2\}, \{3, 4, 5\}\} \subseteq \mathbb{Z}$.

(8) $\{(0, 0), (-1, 2)\} \subseteq \mathbb{Z} \times \mathbb{R}$.

(9) For any set S, $S \in \mathcal{P}(S)$.

(10) For any set S, $S \subseteq \mathcal{P}(S)$.

Problem 3 (~ 5 points.)**.** True or False? *No explanations required.*

(1) The negation of the proposition "Water freezes at 0°C and boils at 100°C" is the proposition "Water neither freezes at 0°C nor boils at 100°C".

(2) $p \wedge p \equiv p$.

(3) $p \rightarrow q \equiv (\neg p) \vee q$

(4) $p \vee (p \rightarrow q)$ is a tautology.

(5) $p \vee (\neg p)$ is a contradiction.

(6) The proposition "If all cats are white, then all dogs are brown" is true.

(7) Let x be any real number. "$x > 0$" is a necessary condition for "$x^2 > 0$".

(8) Let x be any real number. "$x > 0$" is a sufficient condition for "$x^2 > 0$".

(9) The proposition "The Queen of England is immortal if and only if the sun is blue" is true.

(10) Let n be any integer. The proposition "If n is even, then n^2 is even" is logically equivalent to the proposition "If n^2 is odd, then n is odd".