

Name: _____

Spring 2018 Math 245 Exam 3

Please read the following directions:

Please write legibly, with plenty of white space. Please print your name on the designated line, similarly to your quizzes (last name(s) in ALL CAPS). Please fit your answers in the designated areas. To get credit, you must also show adequate work to justify your answers. If unsure, show the work. All problems are worth 5-10 points. The use of notes, calculators, or other materials on this exam is strictly prohibited. This exam will begin at 12:40 and will end at 1:30; pace yourself accordingly. Please remain quiet to ensure a good test environment for others. Good luck!

Problem	Min Score	Your Score	Max Score
1.	5		10
2.	5		10
3.	5		10
4.	5		10
5.	5		10
6.	5		10
7.	5		10
8.	5		10
9.	5		10
10.	5		10
Exam Total:	50		100
Quiz Ave:	50		100
Overall:	50		100

REMINDER: Use complete sentences.

Problem 1. Carefully define the following terms:

- a. \cap

- b. \cup

- c. (absolute) complement

- d. Cartesian product

Problem 2. Carefully define the following terms:

- a. relation

- b. symmetric (relation)

- c. antisymmetric (relation)

- d. trichotomous (relation)

Problem 3. Let $S = \{a, b\}$. Give a two-element subset of $2^{S \times S}$. Be careful with notation.

Problem 4. Let S be a set. Prove that $S \cup \emptyset = S$.

Problem 5. Give a partition of \mathbb{Z} with three parts.

For problems 6 and 7, take ground set $S = \{-1, 0, 1\}$ with relation $R = \{(a, b) : a \leq b^2\}$.

Problem 6. With R, S as above, prove or disprove that R is reflexive.

Problem 7. With R, S as above, prove or disprove that R is transitive.

Problem 8. Prove or disprove: For all sets R, S , we have $R \setminus S = R \Delta S$.

Problem 9. Prove or disprove: For all sets R, S, T satisfying $R \subseteq S$, $S \subseteq T$, and $T \subseteq R$, we must have $R = S$.

Problem 10. Prove or disprove: $|\mathbb{N}| = |\mathbb{N}_0 \times \mathbb{N}_0|$.