Name:

Fall 2018 Math 245 Exam 3

Please read the following directions:
Please write legibly, with plenty of white space. Please fit your answers in the designated areas. Please print your name on the designated line, similarly to your quizzes (last name(s) in ALL CAPS). Writing your name incorrectly will cost you a point. 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 1:00 and will end at 1:50; 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. $=$ (for sets)

b. Associativity theorem (for sets)

c. Distributivity theorem (for sets)

d. De Morgan's Law (for sets)

Problem 2. Carefully define the following terms:

a. power set

b. disjoint

c. equicardinal

d. relation

Problem 3. Let R, S, T be sets. Draw a Venn diagram representing $(R\Delta S) \setminus (R\Delta T)$.

Problem 4. Let S, T be sets. Prove that $|S \times T| = |T \times S|$.

Problem 5. Let R, S, T be sets, with $S \subseteq T$. Prove that $R \cap S \subseteq R \cap T$.

Problem 6. Let A, B be sets. Prove that $A \times (A \cap B) \subseteq (A \cup B) \times B$.

Problem 7. Let S, T be sets with $T \subseteq S$. Let R be a transitive relation on S. Prove that $R|_T$ is transitive.

Problem 8. Let R, S, T, U be sets, with $R \subseteq U$ and $S \subseteq T \subseteq U$. Prove that $R \cup T^c \subseteq R \cup S^c$.

Problem 9. Consider relation $S = \{(a, b) : a \leq b^2\}$ on $\mathbb{R}$. Prove or disprove that S is reflexive.

Problem 10. Consider relation $S = \{(a, b) : a \leq b^2\}$ on $\mathbb{R}$. Prove that $S^+ = R_{full}$.