Name:

Fall 2015 Math 245 Exam 2

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. 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 last at most 75 minutes; pace yourself accordingly. Please leave **only** at one of the designated times: 10am, 10:15am, 10:30am, 10:45am. At all other times please stay in your seat, to ensure a quiet 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
Total:	50		100

Problem 1. Carefully define each of the following terms:

a. gcd

b. (set) union

c. maximal

d. codomain

e. bijection

Problem 2. Consider the posets on $A = \{a, b, c\}$ where a, b are not comparable. Draw a Hasse diagram of each. Be sure to clearly separate the different diagrams.

Problem 3. For all sets A, B, C, prove that $(A \cap B) \setminus C \subseteq A \cup B$.

Problem 4. Let $A = \{a, b, c\}, B = \{a, b, d, e\}$. Prove or disprove that $\mathcal{P}(A) \subseteq \mathcal{P}(B)$.

Problem 5. Let $A = \{a, b, c\}$. Give a relation on A that is simultaneously an equivalence relation *and* a partial order *and* a function.

Problem 6. Use the (extended) Euclidean algorithm to first find $\gcd(33, 9)$, and then to express $\gcd(33, 9)$ as a linear combination of 33 and 9.

Problem 7. Let $A = \{a, b, c\}$. Find all partitions of A.

Problem 8. Prove or disprove: for all functions $f : \mathbb{R} \to \mathbb{R}$, if f is injective then f is surjective.

Problem 9. Let S be a Boolean algebra. Prove that, for any $x \in S$, that $x \oplus 1 = 1$.

Problem 10. Solve the recurrence $a_n = a_{n-1} + 6a_{n-2}$ with initial conditions $a_0 = 0, a_1 = 5$.