

Math 200 Final Exam

Due Monday, April 30th, at 4:15 PM

Complete the following exercises, showing all work. In addition to the solution and showing all work, **you must provide a short paragraph write up with the reasoning for your answer.**

The Final will not be accepted if it is not typed. No exceptions. Additionally you should use proper mathematical format when typing your answers.

You are allowed any and all resources at your disposal, including working with each other and using the internet. However, in the case that you work with someone else, be sure to put your reasoning write ups in your own words - it would be considered academic dishonesty otherwise.

1. $A = \{x \in \mathbb{R} : x \geq 2\}$
 $B = \{x \in \mathbb{R} : -5 \leq x \leq 5 \text{ and } 2x \in \mathbb{N}\}$
 $C = \{14, 8\}$

List the elements in the following set: $(A \cap B) \times C$

2. Prove with any of the four proof techniques you wish that if A and B are sets then $|A \cap (B - A)| = 0$. Make sure to explain which proof technique you are using and why.
3. Create a truth table for the following statement. Make sure to show every step.

$$\neg(p \rightarrow (q \vee p)) \iff (p \wedge q).$$

4. Translate the following symbolic logic into an English Sentence: $5 \mid 6x + 4, \forall x : x \in \mathbb{N}$ Make sure to explain what each of the terms you use means as if you were explaining to someone who had never taken Discrete math.
5. Prove the following with a contrapositive proof: Suppose $a, b, c \in \mathbb{Z}$. If a does not divide bc , then a does not divide b .
6. In your own words write a descriptive paragraph detailing the steps involved in proving a statement with Induction. Give an example of an inductive proof and reference it in your descriptive paragraph.

Good Luck!