

MATH 232 Discrete Math

Homework 1

Basic Information

This assignment is due in Gradescope by 10 PM on the dates below.

Make sure you understand MHC [honor code](#) and have carefully read and understood the additional information on the [class syllabus](#) and the [grading rubric](#). I am happy to discuss any questions or concerns you have!

You are always welcome to ask me for small hints or suggestions on problems.

Problems

Reading Problem 1M (Due: Sunday, February 1)

You'll learn in the reading for Monday that $\mathcal{P}(A)$ is the notation for the *power set* of a set A . What is $\mathcal{P}(\{1,2\} \times \{3\})$? Briefly explain the process you used to get your answer.

List 6 elements in the set $\mathcal{P}(\mathcal{P}(\{1,2\}))$. How many total elements are in this set? (Hint: the reading for Monday's class probably helps with this question!)

Wednesday Problems HW1 (Due: Wednesday, February 4)

1. How would you write the set of natural numbers less than 15 in set builder notation? How about the set of integers which are a square of another integer in set builder notation?

2. Describe all the elements in the following sets A . Briefly explain how you got your answer.

- $A = \{x \in \mathbb{R} : x^2 - x = 6\}$
- $A = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x^2 + y^2 = 1\}$
- $A = \left\{x \in \mathbb{Z} : x^2 = \frac{1}{2}\right\}$

3. Are the following sets B infinite or finite? Why or why not?

- $B = \{x \in \mathbb{Z} : x \text{ is odd}\}$
- $B = \{x \in \mathbb{Z} : |x| < 10\}$

4. Suppose $A = \{b, c, d\}$ and $B = \{a, b\}$. Find each of the following: (This is exercise 2.5 #4 (a) to (e) in DME.) Briefly explain your answers.

- a. $(A \times B) \cap (B \times B)$
- b. $(A \times B) \cup (B \times B)$
- c. $(A \times B) - (B \times B)$
- d. $(A \cap B) \times A$
- e. $(A \times B) \cap B$

5. Let $U = \mathbb{Z}$ and $A = \{5x + 7 : x \in \mathbb{Z}\}$.

- a. Is $16 \in \bar{A}$? Why or why not?
- b. Is $17 \in \bar{A}$? Why or why not?

Reading Problem 1F (Due: Thursday, February 5)

Are the following statements true or false? Briefly explain why you gave the answer you did.

- a. There is an $x \in \mathbb{R}$ so that $x \notin \mathbb{Q}$.
- b. For every $x \in \mathbb{R}$, $x > 5$.
- c. There is an $x \in \mathbb{R}$ so that for all $y \in \mathbb{Q}$, $x > y$.
- d. For every $x \in \mathbb{R}$ there is a $y \in \mathbb{Q}$ so that $x > y$.