

# MAT 108: Problem Set 4

(ADD NAME)

Due 2/7/23 at 11:59 pm on Canvas

## Reminders:

- Your homework submission must be typed up in full sentences, with proper mathematical formatting. Handwritten homework submissions will receive a score of 0. Solutions containing incomplete sentences or poor formatting will lose points.
- You will receive feedback on PS3 by next Tuesday, 2/7. PS3 revisions are due Friday, 2/10 at 11:59 pm. **New policy:** Keep your old solution for PS3. Underneath your old solution, type

`\paragraph{Revised solution.}`

and then type your revised solution. This will help make the re-grading process go more smoothly. For future problem sets (such as PS4 revisions), you can just use the command

`\revisedsolution`

to indicate the start of your revised solution.

## Exercise 1

Let  $A, B, C, D$  be sets. Decide whether each of the following statements is true or false; in each case, either prove the statement or give a counterexample.

- $A - (B \cup C) = (A - B) \cup (A - C)$
- $(A \times B) \cup (C \times D) = (A \cup C) \times (B \cup D)$
- $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$

**SOLUTION.**

## Exercise 2

For each of the following relations defined on  $\mathbb{Z}$ , determine whether it is an equivalence relation. If it is, determine the equivalence classes.

(a)  $x \sim y$  if  $x \neq y$

(b)  $x \sim y$  if  $xy > 0$

(c)  $x \sim y$  if  $x \mid y$  or  $y \mid x$

**SOLUTION.**