

Homework 2

Math 300 (section 901), Fall 2021

This homework is due on Wed., Sept. 8. (Turn in your answers to questions 1–8.)

0. (*This problem is NOT to be turned in.*)

- (a) Read Sections 1.2–1.4.
 - (b) Determine the power set, $\mathcal{P}(A)$, for the set $A = \{0, a, \{i\}\}$.
 - (c) Section 1.1 #1.4
 - (d) Section 1.3 #1.22, 1.24
 - (e) Section 1.4 #1.36
1. (a) Is $\{3, 5\}$ an element of $\mathcal{P}(\mathbb{N})$, a subset of $\mathcal{P}(\mathbb{N})$, or neither? Explain.
(b) Is 3 an element of $\mathcal{P}(\mathbb{N})$, a subset of $\mathcal{P}(\mathbb{N})$, or neither? Explain
(c) Give an example of a subset of $\mathcal{P}(\mathbb{N})$ of cardinality 3.
2. Give an example of two sets A and B such that

$$4 = |A - B| = |A \cap B| + 1 = |B - A| + 2 .$$

Draw the corresponding Venn diagram.

3. For every real number r , let S_r denote the interval $[r, r + 2]$. Give an example of an index set A such that

$$\bigcup_{r \in A} S_r = [-1, 1] \cup [3, 10] .$$

Explain your answer.

4. For every $r \in \mathbb{Q}^+ = \{x \in \mathbb{Q} \mid x > 0\}$, let $A_r = \{x \in \mathbb{Q} \mid r > |x|\}$. Determine the following sets:

$$\bigcup_{r \in \mathbb{Q}^+} A_r \quad \text{and} \quad \bigcap_{r \in \mathbb{Q}^+} A_r .$$

Explain your answers.

- 5. Section 1.1 #1.6, 1.8
- 6. Section 1.2 #1.10, 1.16
- 7. Section 1.3 #1.26, 1.30
- 8. Section 1.4 #1.38, 1.40