Homework 7

Math 300, Fall 2022

This homework is due on Friday, October 7. (Turn in your answers to questions 1–8.)

0. *(This problem is not to be turned in.)* Read Sections 4.2, 4.3, and 3.1
   (a) Section 4.2 #1, 2, 4, 18
   (b) Section 4.3 #3–6, 8
   (c) Let A and B be sets, and let $\mathcal{P}(A)$ and $\mathcal{P}(B)$ denote their respective power sets. *Prove or disprove:*
      (i) If $\{1\} \in \mathcal{P}(A)$, then $1 \in A$.
      (ii) If $A \subseteq B$, then $\mathcal{P}(A) \subseteq \mathcal{P}(B)$.
      (iii) If $A \in B$, then $\{A\} \in \mathcal{P}(B)$.
      (iv) If $A \in B$, then $\{A\} \subseteq \mathcal{P}(B)$.
1. (No proofs necessary for this problem)
   (a) List the elements in $\mathcal{P}(\{1, 2\} \times \{0\})$.
   (b) List the elements in $\mathcal{P}([3, 4] \cap \mathbb{Z})$.
   (c) List the elements in $\mathcal{P}([3, 4]) \cap \mathbb{Z}$.
   (d) List the elements in $\mathcal{P}([3, 4]) \cap \mathcal{P}(\mathbb{Z})$.
2. True/False (no proofs necessary)
   (a) $\{3\} \in \mathcal{P}([3, 4])$
   (b) $\{3, 5\} \in \mathcal{P}([3, 4])$
   (c) $[3, 3.5] \in \mathcal{P}([3, 4])$
3. Consider the set $S = \{\ \{1, 2\},\ \{3\},\ \{4, 6\}\ \}$.
   (a) Is S a subset of $\mathcal{P}(\mathbb{Z})$? Explain briefly.
   (b) Is S an element of $\mathcal{P}(\mathbb{Z})$? Explain briefly.
4. *Prove or disprove*: If n is a positive integer, then $5|(9^n - 4^n)$.
5. Section 4.1 #6
6. Section 4.2 #1(f), 8, 12(c), 16(b,c), 21(a,b)
7. Section 4.3 #2, 10
8. Section 3.1 #2

Writing Assignment 5

Math 300

This homework is due on Friday, October 14.

- Write a draft of three sections of your final paper:
  1. the introduction (what will your paper be about?),
  2. the mathematical background (define and/or explain all unfamiliar terms), and
  3. one section developing one of the main ideas from Writing Assignment 4.
- The expected length is at least two pages.
- *Please* **print** 2 *copies of your draft. As part of a future writing assignment, each student, plus the instructor or grader, will critique another student's draft.*
- If you do **not** turn in this draft, you will receive a 5% penalty on the final paper.