Math 156.01 — Spring 2017 Homework set #1

Name:

Please write your solutions in an organized and systematic manner; use scratch paper to solve the problems first and then write up a neat solution with the relevant work shown.

1. Consider the following sets [5 pts]

$$A = \{-1, 1, 2\}$$
$$B = \emptyset$$
$$C = \{x \in \mathbb{Z}; x^4 - 5x^2 + 4 = 0\}$$
$$D = \{x \in \mathbb{N}; \cos(x) = 0\}$$

   (a) Which of these four sets are equal?

   (b) What is the cardinality of C?

   (c) Find two sets among these such that one will be a proper subset of the other.

   (d) Find $A \cup C$ and $A \cap C$.

   (e) Find $A \cap B$.

2. Give an example of three sets A, B and C such that $B \neq C$ but $B \setminus A = C \setminus A$. [5 pts]

3. Give an example of four different subsets A, B, C and D of $\{1, 2, 3, 4\}$ such that all 6 intersections of two of them (i.e. $A \cap B$, $A \cap C$, $A \cap D$, $B \cap C$, etc.) will be distinct. [5 pts]

4. Find an example of two infinite subsets A_1 and A_2 of $\mathbb{N}$, satisfying $A_1 \cap A_2 = \emptyset$ and $A_1 \cup A_2 = \mathbb{N}$. [5 pts]

5. Compute $\mathcal{P}(\{1, 2, 4\})$. [5pts]

6. (extra credit) [5 pts]

Let A, B and C be sets. "Prove" (i.e. convince me) that if $A \subseteq B$ and $B \subseteq C$ then $A \subseteq C$.