Before beginning this homework assignment, please review the guidelines for submitting homework. Please write down the total amount of time spent working on the assignment at the top of what you turn in. Remember that at least one problem from each assignment must be written in \LaTeX.

1. Functions, from the beginning

Functions and sets are the building blocks of all of mathematics: both pure and applied. In these sections, you’ll learn how to work with functions that are more abstract, but equally useful, than those you encountered in Calculus.

(1) Read Taylor, Sections 5.1 and 5.2 All of the following problems are from Taylor’s text.

(2) List all possible functions $f : \{1, 2\} \to \{a, b, c\}$. (For each you should precisely describe what $f(x)$ is for each $x \in \{1, 2\}$.)

(3) Come up with your own function $f : \mathbb{R}^2 \to \mathbb{R}^2$.

(4) Suppose that $f : X \to Y$ is a function. Explain why the following is a function $f : \mathcal{P}(X) \to \mathcal{P}(Y)$.

$$f(A) = \{ y \in Y : \exists x \in X \text{ s.t. } x \in A \text{ and } f(x) = y \}. $$
for all $A \subseteq X$.  
