

# Math 1A: Sections 308-309

## Worksheet 1: August 31

You should work on the following problems in groups of 4-5 students. It's ok if you don't finish all of them by the time we stop, but make sure everyone in your group knows **how** to solve each of the problems, and not just the solutions. When you write them down, or on the board, take turns doing the writing.

1. Is there a function all of whose values are equal to each other? If so, graph your answer, if not, explain why.

2. Consider the polynomial functions

$$f(x) = -x^2 + 1, \quad g(x) = (x - 1)^2, \quad h(x) = x^3.$$

A) Find all  $x$  such that  $f(x) \leq 2$ . Do the same for  $g(x)$  and  $h(x)$ . Write your answers in interval notation and draw them on the graphs of the functions.

B) Find all  $x$  such that  $|f(x)| < 2$ . Do the same for  $|g(x)|$  and  $|h(x)|$ .

C) Can you find an *upper bound* for  $f$ ? That is can you find a number  $M$  such that  $f(x) \leq M$  for all  $x$ ? What about  $g$  and  $h$ ?

D) Can you find a *lower bound* for  $f$ ? (What should the right definition be?) What about  $g$  and  $h$ ?

E) What about finding upper bounds for  $f$  *restricted* to  $[-1, 1]$ ? That is, can you find  $M$  such that  $f(x) \leq M$  for all  $x$  in  $[-1, 1]$ ? How about  $g$  and  $h$ ? Can you find lower bounds for  $f, g$  and  $h$  on  $[-1, 1]$ ?

3. Graph the functions below. Find their maximum and minimum values if they exist.

A)  $f(x) = \frac{1}{x}$ .

B)  $f(x) = -x^2 + 1$ .

C)  $f(x) = \sin x - 1$ .

D)  $f(x) = \sin(3x - 1)$ .

E)  $f(x) = x \sin x$ .

Warmup

1. Find the domain of the function  $g(x) = 1/\sqrt{x^2 - 6x}$ .
2. Sketch the graph of  $|x^2 - 2x|$ .