Purpose: In this problem set, you will be utilizing our factoring methods, end behavior, and other tools to understand the graphs of polynomial functions.

For today, assume all leading coefficients are 1 or -1 unless you are given different information. We will address what happens in the other case another day.

Facts: If we look really close at zeros, we can get some information about how often that factor shows up. If

$$f(x) = (x-a)^n p(x),$$

where $p(x)$ does not have a factor of $(x-a)$, then more or less, the graph of f will behave like $g(x) = (x-a)^n$ really really close to the zero.

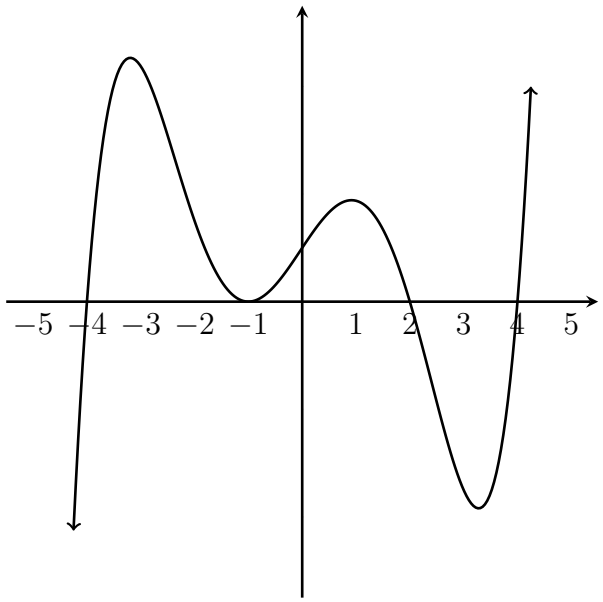
- If $n = 1$:

- If $n = 2$:

- If $n > 1$ and odd:

- If $n > 1$ and even:

1. Goal: Find the formula for the graph of $f(x)$ given below.



(a) What is the end behavior?

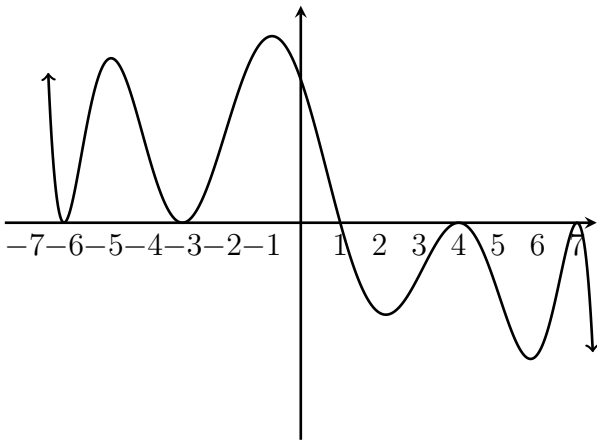
(b) Should your stretch factor be positive or negative? (For today, the stretch factor will be 1 or -1.)

(c) What are the zeros of f?

(d) For each zero, does the graph bounce, cross, or wiggle?

(e) Puzzle time! Put this information together to get a factored form of f.

2. Goal: Find the formula for the graph of $g(x)$ given below.



(a) What is the end behavior?

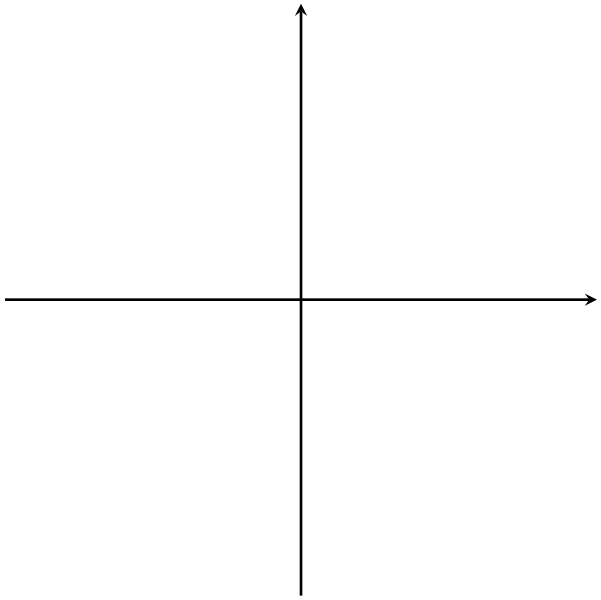
(b) Should your stretch factor be positive or negative?

(c) What are the zeros of g?

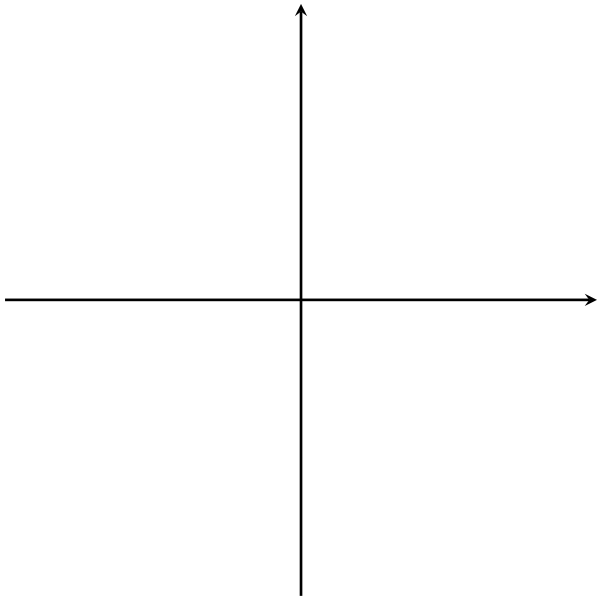
(d) For each zero, does the graph bounce, cross, or wiggle?

(e) Puzzle time! Put this information together to get a factored form of g.

3. Consider the polynomial $f(x) = x^2(x-1)^2(2+x)$. Sketch the graph of $f(x)$.

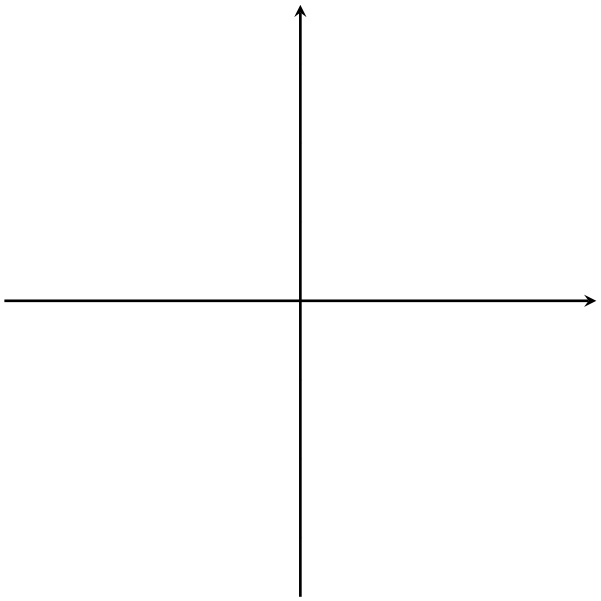


4. Consider the polynomial $g(x) = -x^5 + 4x^4 - 4x^3$. Sketch the graph of $g(x)$.



5. Consider a mystery polynomial with a double root at -2, a single root at 5, a triple root at 0, and a double root at 2. Assume the leading coefficient is negative.

   (a) Sketch a graph of such a mystery function.



   (b) Write an equation of such a mystery function.

6. Outline your strategy for graphing a polynomial that was given to you in formula form.

7. Outline your strategy for determining a possible formula for a polynomial given a graph.

8. Given weird data (like question 5), what is your strategy for handling a problem?