The End Is in Sight Name:_____

What happens when you evaluate functions for very large positive numbers and very large negative numbers? How does that manifest on the graph? Let's investigate!

1. Consider $f(x) = x^3 + 5$
   a. What happens to the y-values as the x-values get bigger and bigger (at the right end of the graph)? Try a few values to investigate.

   b. What happens to the y-values as the x-values get more and more negative (at the left end of the graph)? Try a few values to investigate.

2. Consider $g(x) = 3x^4 + x^3 + 5$
   a. What happens to the y-values as the x-values get bigger and bigger (at the right end of the graph)? Try a few values to investigate.

   b. What happens to the y-values as the x-values get more and more negative (at the left end of the graph)? Try a few values to investigate.

3. Based on your work above, how do you think the largest exponent in the function affects the behavior at the ends of the graph?

4. What do you think would happen to the end behavior if $f(x)$ and $g(x)$ were reflected over the x-axis? How do you know?

5. What do you think would happen to the end behavior if $f(x)$ and $g(x)$ were shifted horizontally or vertically? How do you know?

6. Without graphing the function, make a prediction about the behavior at the right and left ends of each function below.

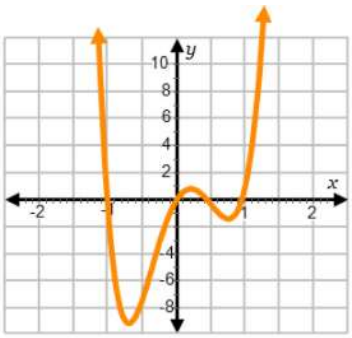
Function	Highest Exponent	Coefficient for Term with Highest Exponent	As x gets more negative, f(x) approaches…	As x gets very large, f(x) approaches…
$f(x) = 3x^2 + 2$				
$f(x) = -2x^3 + x - 2$				

Lesson 2.2 Day 2—Polynomials in the Long Run

Important Ideas:

Check Your Understanding

1. Describe the end behavior of the graph to the right.



2. Is it possible for this graph to have a degree of 5? Why or why not?

3. Which of the following terms, when added to the given polynomial, will change the end behavior? Check all that apply.

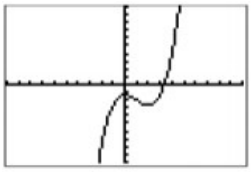
$$y = -2x^7 + 5x^6 - 24$$

- ☐ $-x^8$
- ☐ $-3x^5$
- ☐ $5x^7$
- ☐ 1000
- ☐ -300

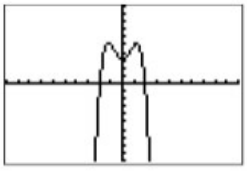
4. Match the polynomial to the graph without using a calculator or Desmos.

1. $y = -2x^3 + 3x + 1$ 2. $y = \frac{1}{3}x^3 - x^2 - \frac{4}{3}$ 3. $y = 3x^2 + 2$ 4. $y = -x^4 + 3x^2 + 3$

A



B



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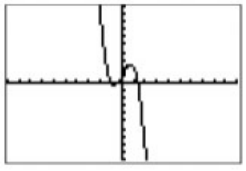

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