

# Day 03 Notes on Polynomial Functions & End Behavior

## Polynomial Vocabulary:

**Degree** of a polynomial- the highest exponent in the equation.

**Leading Coefficient**- First coefficient when the equation is in standard form.

**Increasing Intervals**- The parts of the graph where the value of the function is increasing (going up a roller coaster)

**Decreasing Intervals**- The parts of the graph where the value of the function is decreasing (going down a roller coaster)

**Turning Points**- Where the graph changes between increasing and decreasing intervals.

**End Behavior**- What the graph is approaching as it extends infinitely to the right and left.

<p>1. Linear (1<sup>st</sup> degree) <math>y = -2x + 3</math></p> <p>Y min -10 Y max 10</p> <p>a) Highlight the <u>decreasing</u> intervals on your sketch. b) Leading Coefficient: _____ c) Degree Even or Odd? _____ d) Number of Turning Points? _____ e) Arrows the same direction or opposite? _____</p>	<p>2. Quadratic (2<sup>nd</sup> Degree) <math>y = 3x^2 - 4</math></p> <p>Y min -10 Y max 10</p> <p>a) Highlight the <u>increasing</u> intervals on your sketch. b) Leading Coefficient: _____ c) Degree Even or Odd? _____ d) Number of Turning Points? _____ e) Arrows the same direction or opposite? _____</p>
<p>3. Cubic (3<sup>rd</sup> Degree) <math>y = 2x^3 - x^2 - 13x - 6</math></p> <p>Y min -25 Y max 15</p> <p>a) Highlight the <u>increasing</u> intervals on your sketch. b) Leading Coefficient: _____ c) Degree Even or Odd? _____ d) Number of Turning Points? _____ e) Arrows the same direction or opposite? _____</p>	<p>4. Quartic (4<sup>th</sup> Degree) <math>y = -3x^4 + 5x^3 + 17x^2 - 13x - 6</math></p> <p>Y min -15 Y max 35</p> <p>a) Highlight the <u>decreasing</u> intervals on your sketch. b) Leading Coefficient: _____ c) Degree Even or Odd? _____ d) Number of Turning Points? _____ e) Arrows the same direction or opposite? _____</p>

5. Quintic (5<sup>th</sup> Degree)  $y = x^5 - 10x^3 + 9x$

Y min -40

Y max 45

a) Highlight the decreasing intervals on your sketch.

b) Leading Coefficient: \_\_\_\_\_

c) Degree Even or Odd? \_\_\_\_\_

d) Number of Turning Points? \_\_\_\_\_

e) Arrows the same direction or opposite? \_\_\_\_\_

6. Hexic (6<sup>th</sup> Degree)

$$y = -x^6 - 2x^5 + 10x^4 + 20x^3 - 9x^2 - 18x$$

Y min -20

Y max 140

a) Highlight the increasing intervals on your sketch.

b) Leading Coefficient: \_\_\_\_\_

c) Degree Even or Odd? \_\_\_\_\_

d) Number of Turning Points? \_\_\_\_\_

e) Arrows the same direction or opposite? \_\_\_\_\_

- What does the sign of leading coefficient tell me about the graph? In other words, what do I know about the graph when it is a positive leading coefficient versus a negative?

- What does the degree tell me about the arrows (or end behavior)?

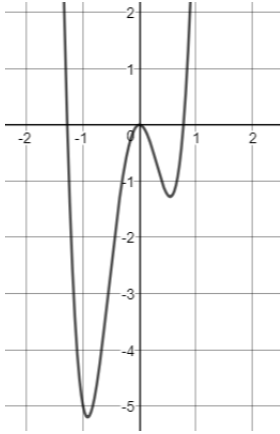
- What does the degree tell me about the number of turning points?

- What does the degree tell me about the number of solutions (x-intercepts)?

## End Behavior

What happens to  $f(x)$  as  $x$  gets larger and smaller?

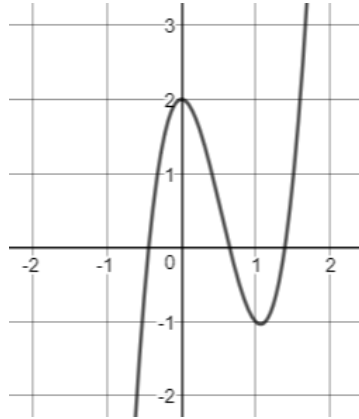
1)



As  $x \rightarrow \infty$  \_\_\_\_\_

As  $x \rightarrow -\infty$  \_\_\_\_\_

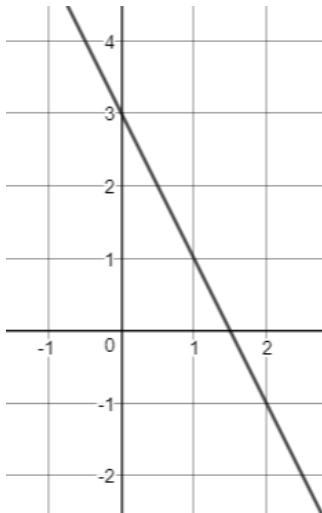
2)



As  $x \rightarrow \infty$  \_\_\_\_\_

As  $x \rightarrow -\infty$  \_\_\_\_\_

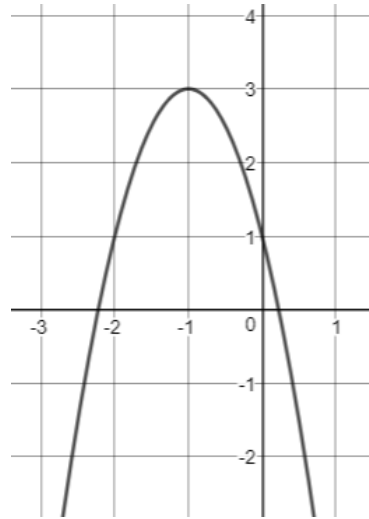
3)



As  $x \rightarrow \infty$  \_\_\_\_\_

As  $x \rightarrow -\infty$  \_\_\_\_\_

4)



As  $x \rightarrow \infty$  \_\_\_\_\_

As  $x \rightarrow -\infty$  \_\_\_\_\_

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**5-7: Without graphing the polynomial, fill in the information about the function using the equation.**

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5.  $y = 8x^3 - 5x^2 + x - 10$

- a) What is the degree? \_\_\_\_\_
- b) Is the degree even or odd? \_\_\_\_\_
- c) What is the leading coefficient? \_\_\_\_\_
- d) What is the maximum number of turning points? \_\_\_\_\_
- e) What is the maximum number of zeros? \_\_\_\_\_
- f) Right side going up or down? \_\_\_\_\_
- g) End behavior same or opposite? \_\_\_\_\_
- h) End behavior: As  $x \rightarrow \infty$   $f(x) \rightarrow$   
As  $x \rightarrow -\infty$   $f(x) \rightarrow$

6.  $y = -2x^4 + 7x^2 + 3x$

- a) What is the degree? \_\_\_\_\_
- b) Is the degree even or odd? \_\_\_\_\_
- c) What is the leading coefficient? \_\_\_\_\_
- d) What is the maximum number of turning points? \_\_\_\_\_
- e) What is the maximum number of zeros? \_\_\_\_\_
- f) Right side going up or down? \_\_\_\_\_
- g) End behavior same or opposite? \_\_\_\_\_
- h) End behavior: As  $x \rightarrow \infty$   $f(x) \rightarrow$   
As  $x \rightarrow -\infty$   $f(x) \rightarrow$

7.  $y = x^6 - x^5 + 4x^3 + 9x^2 + 1$

- a) What is the degree? \_\_\_\_\_
- b) Is the degree even or odd? \_\_\_\_\_
- c) What is the leading coefficient? \_\_\_\_\_
- d) What is the maximum number of turning points? \_\_\_\_\_
- e) What is the maximum number of zeros? \_\_\_\_\_
- f) Right side going up or down? \_\_\_\_\_
- g) End behavior same or opposite? \_\_\_\_\_
- h) End behavior: As  $x \rightarrow \infty$   $f(x) \rightarrow$   
As  $x \rightarrow -\infty$   $f(x) \rightarrow$