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NOTES: Section 5.2 – Evaluate and Graph Polynomial Functions

Goals: #1 - I can determine whether a function is polynomial and if so, state it's degree, type, and leading coefficient.

#2 - I can use direct substitution to evaluate a polynomial for the given value of x.

#3 - I can use synthetic substitution to evaluate a polynomial for the given value of x.

#4 - I can describe the end behavior (general shape) of the graph of a polynomial by looking at its equation.

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Homework: Lesson 5.2 Worksheet

Warm Up: Simplify the expression.

1. $\frac{-14x^{-3}y^{5}}{35xy^{3}}$

2. $(4a^{5}b^{-2})^{-3}$

3. $(2r^{3}s^{3})(r^{-7}s^{5})$

2. $\frac{xy^{-1}}{x^{2}y} \cdot \frac{7x^{3}}{y^{-4}}$

Review:

Recall that a ______________________ is a number, variable, or a product of numbers and variables. Monomials ______________ have a _____________ or ____________ exponent.

Examples:

A ____________________________ is a monomial or a sum of monomials.

Examples:

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Notes:

A ____ is a function of the form:

$$f(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0$$

(exponents are ________________ numbers and the coefficients are all __________ numbers).

For this function, ___________ is the ____,

___________ is the __________________, and ___________ is the ______________________________.

A polynomial function is in ____

if its terms are written in descending order of exponents form left to right.

Common Polynomial Functions			
Degree	**Type**	**Standard Form**	**Example**
		$f(x) = a_0$	
		$f(x) = a_1 x + a_0$	
		$f(x) = a_2 x^2 + a_1 x + a_0$	
		$f(x) = a_3 x^3 + a_2 x^2 + a_1 x + a_0$	
		$f(x) = a_4 x^4 + a_3 x^3 + a_2 x^2 + a_1 x + a_0$	

Example #1: Decide whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient.

1. $h(x) = x^4 - \frac{1}{4}x^2 + 3$

2. $f(x) = 5x^2 + 3x^{-1} - x$

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Example #2: Use <u>direct substitution</u> to evaluate the polynomial function for the given value of x.

1. $f(x) = 2x^4 - 5x^3 - 4x + 8;\;\; x = 2$
2. $g(x) = x^4 + 2x^3 - 3x^2 - 7;\;\; x = -2$

You practice: Use <u>direct substitution</u> to evaluate the polynomial function for the given value of x.

1. $h(x) = x^3 - 5x^2 + 6x + 1;\;\; x = 4$
2. $g(x) = -3x^3 + x^2 - 12x - 5;\;\; x = 2$

Example #3: Use <u>synthetic substitution</u> to evaluate the polynomial function for the given value of x.

1. $f(x) = 2x^4 - 5x^3 - 4x + 8;\;\; x = 2$
2. $g(x) = x^4 + 2x^3 - 3x^2 - 7;\;\; x = -2$

You practice: Use <u>synthetic substitution</u> to evaluate the polynomial function for the given value of x.

1. $h(x) = x^3 - 5x^2 + 6x + 1;\;\; x = 4$
2. $g(x) = -3x^3 + x^2 - 12x - 5;\;\; x = 2$

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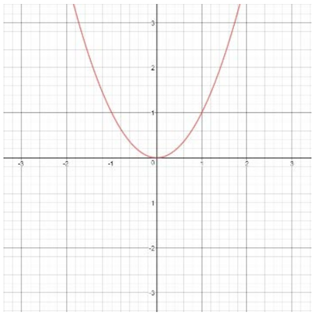
Exploration #1: Work with a partner and fill in the following blanks.

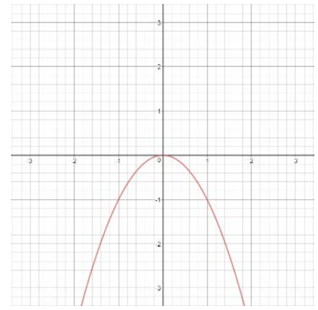
1. $f(x) = x^2$



Degree:

Leading coefficient:

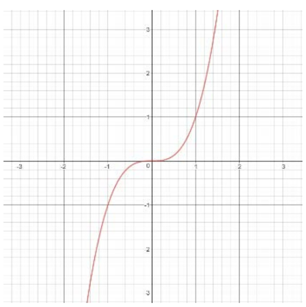
2. $f(x) = -x^2$



Degree:

Leading coefficient:

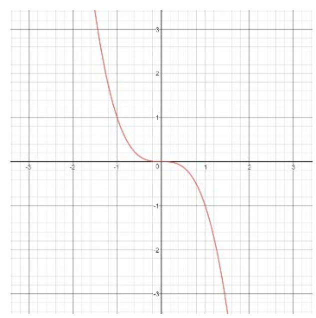
3. $f(x) = x^3$



Degree:

Leading coefficient:

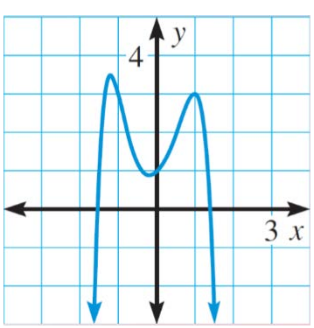
4. $f(x) = -x^3$



Degree:

Leading coefficient:

5. Describe the degree (even or odd) and leading coefficient (positive or negative) of the polynomial function whose graph is shown.



Degree (circle one): Even Odd

Leading coefficient (circle one): Even Odd

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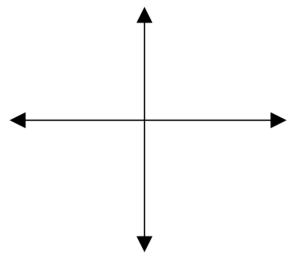
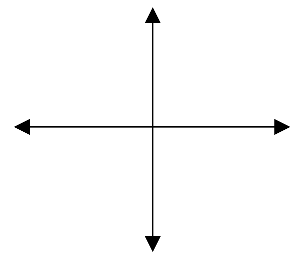
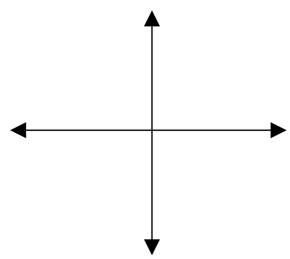
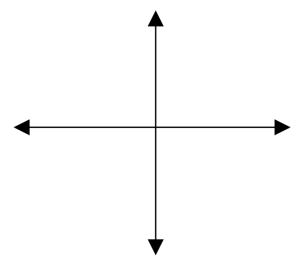
End Behavior		
Degree ⇉ / Sign of Leading Coefficient ⇊	Degree is <u>EVEN</u>	Degree is <u>ODD</u>
Leading Coefficient is <u>POSITIVE (+)</u>		
Leading Coefficient is <u>NEGATIVE (-)</u>		

Example #1: Describe the end behavior of the graph of the polynomial function by completing the statement. Sketch a general picture of the graph to help.

1. $f(x) = 3x^{10} - 16x$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow -\infty$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow +\infty$

2. $f(x) = -2x^3 + 7x - 4$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow -\infty$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow +\infty$

You practice: Describe the end behavior of the graph of the polynomial function by completing the statement. Sketch a general picture of the graph to help.

1. $f(x) = x^7 + 3x^4 - x^2$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow -\infty$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow +\infty$

2. $f(x) = -5x^8 + 8x^7$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow -\infty$

$\boldsymbol{f(x)} \rightarrow$ ____ **as** $\boldsymbol{x} \rightarrow +\infty$