

Polynomial Functions

Lesson 4.1

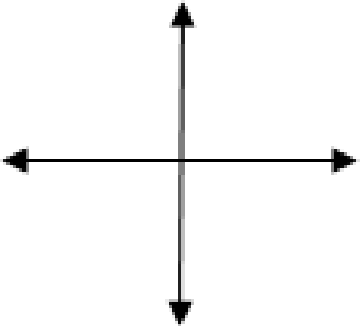
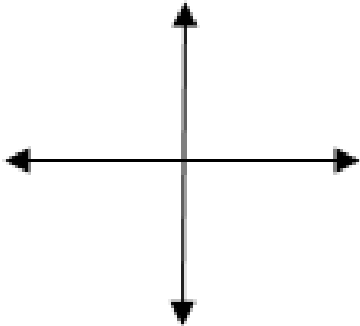
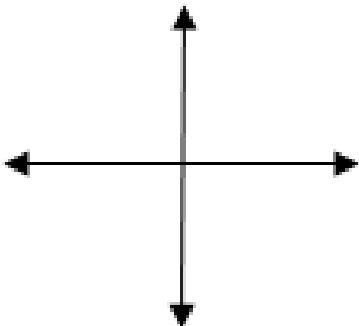
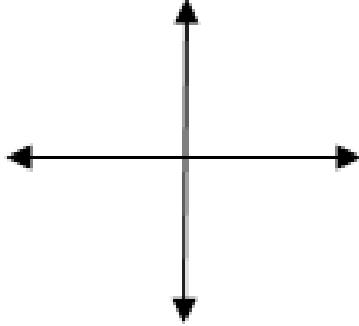
Polynomial Functions

Name _____

A **monomial** is a number, a variable, or the product of a number and one or more variables. A **polynomial** is a monomial or a sum of monomials. A **polynomial function** is of the form $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$. When a polynomial is written in descending powers of x , the number in front (multiplied by the highest power of x) is the **leading coefficient**. The highest power of x is the **degree** of the polynomial. The last term is the **constant**.

Exploration

Using Desmos or a graphing calculator, graph the following functions. Make a quick sketch, then describe their end behavior. Are they rising on the right or falling on the right?

Linear	$f(x) = \frac{3}{4}x + 2$	$f(x) = 4x - 3$	$f(x) = -\frac{1}{2}x - 5$	$f(x) = -x + 4$
				
	_____ on the right	_____ on the right	_____ on the right	_____ on the right

A polynomial is a monomial or a sum of monomials. A polynomial function is a function of the form $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$ where $a_n \neq 0$, the exponents are all **whole numbers**, and the coefficients are all real numbers. For this function, a_n is the **leading coefficient**, n is the **degree**, and a_0 is the **constant** term. A polynomial function is in standard form when its terms are written in descending order of exponents from left to right.

Common Polynomial Functions			
Degree	Type	Standard Form	Example
0	Constant	$f(x) = a_0$	$f(x) = -14$
1	Linear	$f(x) = a_1 x + a_0$	$f(x) = 5x - 7$
2	Quadratic	$f(x) = a_2 x^2 + a_1 x + a_0$	$f(x) = 2x^2 + x - 9$
3	Cubic	$f(x) = a_3 x^3 + a_2 x^2 + a_1 x + a_0$	$f(x) = x^3 - x^2 + 3x$
4	Quartic	$f(x) = a_4 x^4 + a_3 x^3 + a_2 x^2 + a_1 x + a_0$	$f(x) = x^4 + 2x - 1$

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

a) $f(x) = -4x^5 + 7x^2 - 2$

Yes 5^{th} degree -4

b) $g(x) = 0.5x^2 + \sqrt{3}x^4 + 19$

Yes $\sqrt{3}x^4 + 0.5x^2 + 19$

c) $h(x) = -x^3 - 4x^{-4} - 3x$

no

d) $k(x) = x^2 + 9^x - 1$

no

ADEO
 Alphabetical
 Descending
 Exponential
 Order

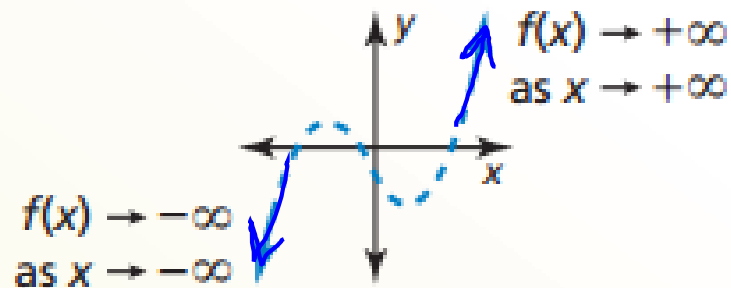
lc -4 , Const. -2
 leading coeff $\sqrt{3}$
 lc $\sqrt{3}$
 deg 4^{th}
 Const. 19

Describe the end behavior of the graph of $f(x) = -0.3x^3 + 1.7x^2 - 4x + 6$.

End Behavior of Polynomial Functions

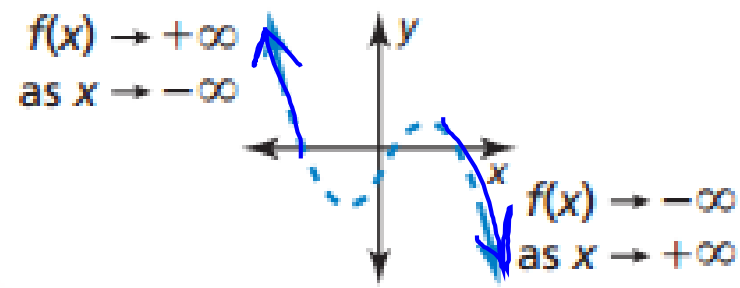
Degree: odd

Leading coefficient: positive



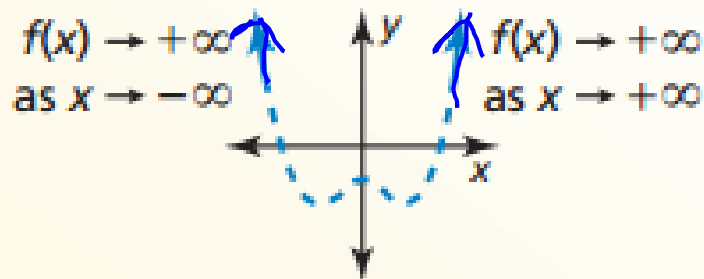
Degree: odd

Leading coefficient: negative



Degree: even

Leading coefficient: positive



Degree: even

Leading coefficient: negative

