

Name \_\_\_\_\_

## Algebra 2

### Lesson 6-1

#### Polynomial Functions

A polynomial is a series of algebraic terms with + and – signs between them. The **degree** of a polynomial is the largest exponent value in the expression. A polynomial is in **standard** form when all “like” terms have been combined and the polynomial has been written in **descending** order.

	polynomial	degree	leading coefficient
<b>Examples:</b>	$P(x) = 5x^3 + 4x^2 - 9x + 1$	3	5
	$H(x) = 4x^7 - 2x^4 + 6x - 3$	7	4
	$R(x) = 3x^3y^3 + 2xy^2 - 6$	5	3

A polynomial with one (1) term is called a **monomial**, with (2) terms it is called a **binomial**, and with three (3) terms it is called a **trinomial**.

**Examples:**  $4c$  is a monomial.  $2x^2 - 3$  is a binomial.  $x^2 - 3x + 5$  is a trinomial

Some expressions look like polynomials but are **NOT** polynomials.

**Examples:**  $5^x$   $3n^{4.25} - 4n^2$ ,  $4\sqrt{x}$  The reason this is so is that by definition a polynomial is:

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x^1 + a_0$$

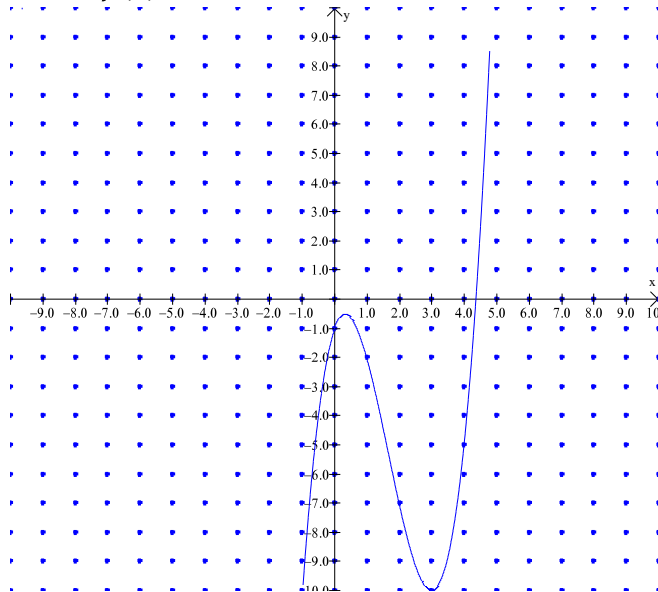
Polynomials are simplified by adding or subtracting by adding or subtracting like terms. Take extra care when working with double or triple negative and rearrange each polynomial into standard form BEFORE simplifying.

**Examples:** Simplify  $(2x^2 - 4x + 5) + (5x + x^2 - 9)$  put into standard form  
 $(2x^2 - 4x + 5) + (x^2 + 5x - 9)$  rearrange  
 $(2x^2 + x^2) + (-4x + 5x) + (5 - 9)$  simplify  
 $3x^2 + x - 4$

Sometimes polynomials are graphed to quickly locate x-intercepts or predict the graph’s behavior. The simplest way to describe a graphs behavior is to read/interpret the graph from left to right.

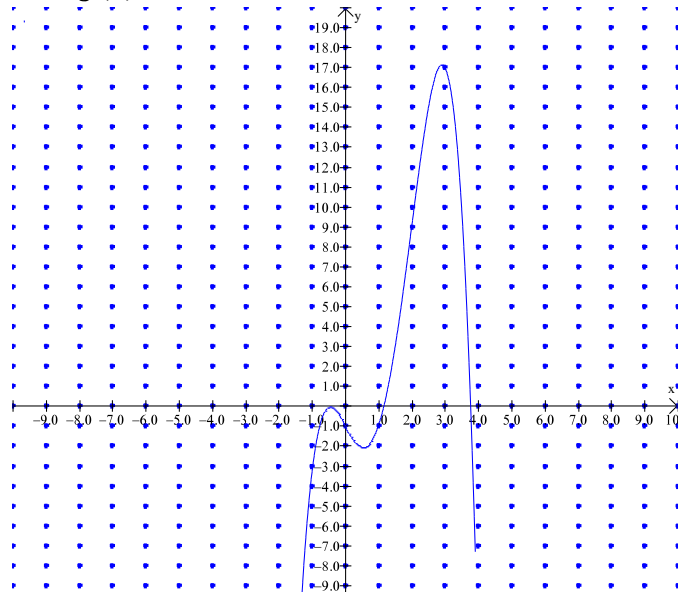
**Example:** Describe the behavior (left to right) of the following functions:

$$f(x) = x^3 - 5x^2 - 3x - 1$$



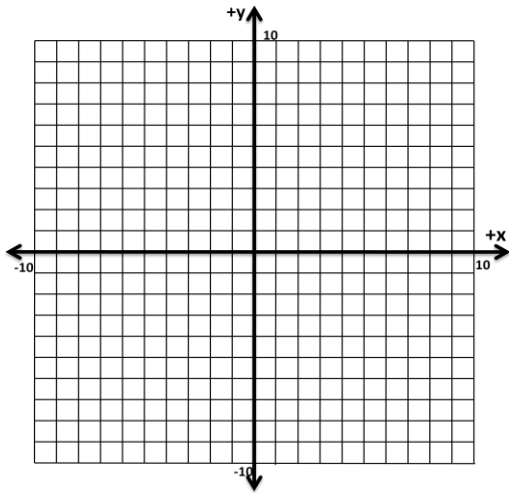
Function increases, changes direction, decreases, changes direction, increases, has one x-intercept

$$g(x) = -x^4 + 5x^3 - 3x - 1$$



function increases, changes direction, decreases, changes direction, increases, changes direction, decreases, has two x-intercepts

Graph  $= x^3 + 3x^2 - x + 1$ , and describe the function's behavior.



Write *sometimes*, *always*, or *never* for each of the following statements.

A cubic polynomial must have 3 terms.

A quadratic polynomial must have a degree of 2.

The leading coefficient is the largest coefficient in the expression.

An expression with a variable as the exponent is a polynomial. (e.g.  $5^x + 4 - 3x^2$ )

Add/Subtract. Write in Standard Form and classify it by its degree and number of terms:

a)  $2x + 5x^2 - 4 + 3x + 1$

b)  $x^2 - 4x + 3x^2 + 4x^3 + 2x$

Imagine a rectangular prism having a square base,  $x^2$ , and a height of  $(x - 3)$ . What are the prism's dimensions if it holds a volume of  $108 \text{ in}^3$ ?

find the degree of the following:

a)  $-2y^3$

b)  $3a^2b^3c$

c)  $2n^2 - 5n + 3$

d)  $5a^3b^2c + 2a^4 - 4c^3 + a^3c$

e)  $5^3 - y$