

Algebra 2

Lesson 6-1: Polynomial Functions

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A polynomial is a series of algebraic terms, monomials, 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.

Degree	Name Using Degree	Polynomial Example	Number of Terms	Name Using Number of Terms
0	constant	6	1	monomial
1	linear	$x + 3$	2	binomial
2	quadratic	$3x^2$	1	monomial
3	cubic	$2x^3 - 5x^2 - 2x$	3	trinomial
4	quartic	$x^4 + 3x^2$	2	binomial
5	quintic	$-2x^5 + 3x^2 - x + 4$	4	polynomial of 4 terms

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:

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

(That is: a series of integers multiplied by a variable raised to a whole number!)

$$f(x) = (\text{constant})(x)^{\text{degree}} + (\text{const.})(x)^{\text{degree}} \dots + \text{constant}$$

x degrees are in descending order

Polynomials are to be written in standard form. When there are multiple polynomials, simplify through distribution, and adding or subtracting like terms. Take extra care when working negatives and coefficients outside parentheses.

Simplify, write in standard form, and classify:

$x^2 + x^3 - 9$ $= x^3 + x^2 - 9$ degree: 3rd # of terms: 3 cubic trinomial	$2a(a^2 - 4)$ $= 2a^3 - 8a$ degree: 3rd # of terms: 2 cubic binomial
$(3x^3 - 4x + 1) - (1 + 4x + x^2)$ $3x^3 - x^2 - 4x + 4x + 1 - 1$ $= 3x^3 - x^2$ degree: 3rd # of terms: 2 cubic binomial	$5x^4 - 7$ degree: 4th # of terms: 2 quartic binomial

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

A cubic polynomial must have 3 terms. *sometimes*

Cubic is 3rd degree, no constraint on # of terms

A quadratic polynomial must have a degree of 2. *Always -*

Quadratic is a 2nd polyn.

The leading coefficient is the largest coefficient in the expression. *Sometimes*

L.C. can be any number $\Rightarrow$ positive or negative

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

Never - here 5^x is exponential