Polynomials

Vocabulary

Monomial: A number, a variable or the product of a number and one or more variables.

Polynomial: A monomial or a sum of monomials.

Binomial: A polynomial with exactly two terms.

Trinomial: A polynomial with exactly three terms.

Coefficient: A numerical factor in a term of an algebraic expression.

Vocabulary

Degree of a monomial: The sum of the exponents of all of the variables in the monomial.

Degree of a polynomial in one variable: The largest exponent of that variable.

Standard form: When the terms of a polynomial are arranged from the largest exponent to the smallest exponent in decreasing order.

Degree of a Monomial

What is the degree of the monomial?

$$5x^4b^2$$

- The degree of a monomial is the sum of the exponents of the variables in the monomial.
- The exponents of each variable are 4 and 2. 4+2 = 6.
  - The degree of the monomial is 6.
  - The monomial can be referred to as a sixth degree monomial.

Polynomials in One Variable

- A polynomial is a monomial or the sum of monomials

$$4x^2 \qquad 3x^3 - 8 \qquad 5x^2 + 2x - 14$$

- Each monomial in a polynomial is a term of the polynomial.
  - The number factor of a term is called the coefficient.
  - The coefficient of the first term in a polynomial is the ***lead coefficient***.
- A polynomial with two terms is called a ***binomial.***
- A polynomial with three terms is called a ***trinomial.***

Polynomials in One Variable

- The degree of a polynomial in one variable is the largest exponent of that variable.

2 A constant has no variable. It is a 0 degree polynomial.

$4x+1$ This is a 1st degree polynomial. 1st degree polynomials are ***linear***.

$5x^2+2x-14$ This is a 2nd degree polynomial. 2nd degree polynomials are ***quadratic***.

$3x^3-8$ This is a 3rd degree polynomial. 3rd degree polynomials are ***cubic.***

Example

Classify the polynomials by degree and number of terms.

	Polynomial	Degree	Classify by degree	Classify by number of terms
a.	5	Zero	Constant	Monomial
b.	$2x-4$	First	Linear	Binomial
c.	$3x^2+x$	Second	Quadratic	Binomial
d.	x^3-4x^2+1	Third	Cubic	Trinomial

Standard Form

- To rewrite a polynomial in standard form, rearrange the terms of the polynomial starting with the largest degree term and ending with the lowest degree term.
- The ***leading coefficient***, the coefficient of the first term in a polynomial written in standard form, should be positive.

Examples

Write the polynomials in standard form.

$5x + 4x^4 - x^2 - 7$

$4x^4 - x^2 + 5x - 7$

$2x^3 - x^4 - 7 + 5x + 5x^2$

$-x^4 + 2x^3 + 5x^2 + 5x - 7$

$-1(-x^4 + 2x^3 + 5x^2 + 5x - 7)$

$x^4 - 2x^3 - 5x^2 - 5x + 7$

Remember: The lead coefficient should be positive in standard form.

To do this, multiply the polynomial by –1 using the distributive property.

Practice

Write the polynomials in standard form and identify the polynomial by degree and number of terms.

1. $7 - 3x^3 - 2x^2$

2. $1 + 3x^2 + 2x$

Problem 7

$$7-3x^3-2x^2$$

$$7-3x^3-2x^2$$

$$-3x^3-2x^2+7$$

$$-1\left(-3x^3-2x^2+7\right)$$

$$3x^3+2x^2-7$$

This is a 3rd degree, or cubic, trinomial.

Problem 2

$$1+3x^2+2x$$

$$1+3x^2+2x$$

$$3x^2+2x+1$$

This is a 2nd degree, or quadratic, trinomial.