

Lesson: An Intro to Polynomials

We can extend our knowledge of exponents to another algebraic topic – polynomials

Before we define what a polynomial is, it is usually easier to see a few examples of what is or is not a polynomial.

The following ARE polynomials:

- $x^2 - 3x + 8$
- $x^7 - 5x^4 + 2x^3 + x$
- 9
- $7x + \pi$
- $x^3 + \frac{2}{3}$

The following ARE NOT polynomials:

- $\sqrt{x} - 4$
- $4x^{-4} - 7x^{-3}$
- $\frac{4}{x} - \frac{2}{x+3}$

Now we can more formally define a polynomial.

Polynomial

An expression with real numbers, variables, and whole number exponents.

Descending Order

Ordering a polynomial from the largest exponent to the smallest exponent, and any freestanding number without a variable is last

Example 1

Put the polynomials in descending order.

a. $x^3 + 4x^5 - 2x^7 + 3x^2 + 5x^8$

b. $x^2 - x^3 + x^4 - x^5 - x^6 + 3$

Term

Any part in a polynomial that is separated by a “+” or “-” sign is considered to be its own term

Variables

The letters in a polynomial that represent numbers

Coefficients

The numbers attached to the variables

Constant Term

The freestanding number within a polynomial that is not attached to any variables

Example 1

Examine the polynomials, then determine the variables, coefficients, and constant terms

Polynomial	Terms	Variable(s)	Coefficient(s)	Constant
$2x + 3$				
$3x^2 - x + 5$				
5				
$2x^2y + 3y - x$				

Degree of a Term

The degree of a term is the sum of the exponents of that term.

Example 2

Identify the degree of each term

Term	Degree	Term	Degree
x^4		x^4y^3	
$3y^6$		x^7y^9	
x		$x^4y^2z^5$	
6		xy^4	

Degree of a Polynomial

The degree of a polynomial is the same as the degree of the term of highest degree within that polynomial

Leading Coefficient

The leading coefficient is the coefficient attached to the term of highest degree in a polynomial

Trinomial

A polynomial with 3 terms

Binomial

A polynomial with 2 terms

Monomial

A polynomial with 1 term

Example 3

Identify the degree of each polynomial and the type of polynomial it is.

Polynomial	Degree of Each Term, Respectively	Deg of Polynom	Leading Coefficient	Type of Polynomial
$x^5 + 4x^3 - 2x$				
$-5x^2 + 18x$				
$6x + 2x^4 - 3x^2$				
$x^5 + 2x^7 - 4$				
8				

Evaluating Polynomials

Evaluating polynomials is not unlike evaluating other expressions we've seen in this course.

Example 4

Evaluate the polynomials for $x = -2$.

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

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

c. $\frac{1}{4}x^3 - \frac{1}{2}x^2 + 5x$