

Polynomials - Add, Subtract, Multiply, Divide Video Lecture

Sections 5.2, 5.3, 5.4, 5.6, and 5.7

Course Learning Objective:

Simplify polynomial expressions.

Weekly Learning Objectives:

- 1) Define polynomial, monomial, binomial, and trinomial.**
- 2) Simplify a polynomial by combining like terms.**
- 3) Add and subtract polynomials.**
- 4) Use the distributive property to multiply polynomials.**
- 5) Multiply two binomials using the FOIL method.**
- 6) Square a binomial.**
- 7) Multiply the sum and difference of two terms.**
- 8) Cube a binomial.**
- 9) Divide a polynomial by a monomial.**
- 10) Use long division to divide a polynomial by another polynomial.**
- 11) Use synthetic division to divide a polynomial by a binomial.**

Polynomials - Adding, Subtracting, Multiplying and Dividing

A **polynomial** is a term or finite sum of terms of the form: ax^n
where a is any real number and n is any whole number.

Examples:

A **monomial** is a polynomial with only one term.

A **binomial** is a polynomial with two terms.

A **trinomial** is a polynomial with three terms.

How to add or subtract polynomials:

1) Combine like terms by adding or subtracting the coefficients of like terms

Examples:

$$(x^2 + x) - (3x^2 + 2x - 1) =$$

$$(9b^3 - 4b^2 + 3b - 2) - (-2b^3 - 3b^2 + b) =$$

How to multiply:

1) **Monomial x Monomial:** Multiply coefficients and add exponents of like variables

$$(-3m^6)(5m^4) =$$

2) **Monomial x Polynomial:** Distribute monomial across parentheses, multiplying as in 1)

$$9xy^3(-3x^2y^4 + 6xy - 2x) =$$

3) **Polynomial x Polynomial:** Multiply each term in the first polynomial by each term in the second polynomial. Combine like terms.

$$(9y - 2)(8y^2 - 6y + 1) =$$

4) **Binomial x Binomial:** Known as FOIL - FIRST OUTER INNER LAST

$$(r - 6)(r + 8) =$$

$$(2x - 4)(3x + 1) =$$

$$(x+y)^2 =$$

Square of a Binomial:

$$(\square \pm \Delta)^2 = \square^2 \pm 2\square\Delta + \Delta^2$$

$$(x-4y)^2 =$$

$$(2r+3s)^2 =$$

$$(x+y)(x-y) =$$

Difference of Squares:

$$(\square + \Delta)(\square - \Delta) = \square^2 - \Delta^2$$

$$(2-r)(2+r) =$$

$$(3x-2y)(3x+2y) =$$

$$(x+y)^3 =$$

Cubing a Binomial:

$$(\square + \Delta)^3 = \square^3 + 3\square^2\Delta + 3\square\Delta^2 + \Delta^3$$

$$(\square - \Delta)^3 = \square^3 - 3\square^2\Delta + 3\square\Delta^2 - \Delta^3$$

$$(2x-y)^3 =$$

$$(3x+2y)^3 =$$

Miscellaneous Examples:

$$(2y^z - 3)(y^z + 4) =$$

$$(2y^x - 1)(2y^x + 1) =$$

$$(3z^{2z} - 2)^2 =$$

How to divide a:

1) Polynomial divided by a Monomial:

$$\frac{120m^6 - 60m^3 + 80m^2}{2m} =$$

$$(5x^4 - 6x^3 + 8x) \div 3x^2 =$$

2) Polynomial divided by a Polynomial - LONG DIVISION

$$\frac{m^2 - 2m - 24}{m - 6} =$$

$$\frac{x^2 + 11x + 16}{x + 8} =$$

$$\frac{4t^4 + t^3 + 7}{t^2 + 1} =$$

$$\frac{y^3 - 1}{y - 1} =$$

Synthetic Division: This is a shortcut to division by a linear binomial

$$(4x^3 - 3x^2 + 2x - 3) \div (x - 2) =$$

$$\frac{5p^3 - 6p^2 + 3p + 14}{p + 1} =$$

$$\frac{x^4 + 81}{x - 3} =$$