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 mulitply:

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

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

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

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