



Essential Question: How do I add, subtract, and multiply polynomials?

Questions / Big Ideas

Key Terms

Like Terms \equiv Terms that have the same power (base and exponent).

Distribute \equiv To multiply a term (or terms) into another polynomial.

- Ex. monomial by binomial: $4(3x - 2) = 12x - 8$

Operations on Polynomials

Adding Polynomials

1. Combine Like Terms
(use 0 as the coefficient for terms without “like” matches).
2. Re-order in descending order
(standard form).

Add: $(6a^3+12a^2-15a)+(4a^2-12a+8)$

$$\begin{array}{r} 6a^3+12a^2-15a+0 \\ + 0a^3+4a^2-12a+8 \\ \hline 6a^3+16a^2-27a+8 \end{array}$$

Guided Practice – Multiply the monomials and simplify.

- Example 1 (Adding)
 $(5x^4 + 10x^3 - 9x) + (2x^3 - 7x^2 - 3)$

- Example 2 (Adding)
 $f(x) = 5x^2 + 4x + 3$ and
 $g(x) = 7x^3 + 10x^2 - x - 2$
What is the sum: $f(x) + g(x)$?

Questions / Big Ideas

Subtracting Polynomials (Differences)

Find the Difference

$$\begin{aligned} & (6a^3 + 12a^2 - 15a) - (4a^2 - 12a + 8) \\ &= 6a^3 + \underline{12a^2} - \underline{15a} - \underline{4a^2} + \underline{12a} - 8 \\ &= 6a^3 + (12a^2 - 4a^2) + (12a - 15a) - 8 \\ &= 6a^3 + 8a^2 - 3a - 8 \end{aligned}$$

1. Distribute “- 1” into the 2nd polynomial (this changes the sign of each term inside the 2nd polynomial).
2. Combine like terms (use 0 as the coefficient for terms without “like” matches).
3. Re-order in descending order (standard form).

Guided Practice – Subtract the polynomials and simplify.

- Example 1 (Subtracting)
 $(5x^4 + 10x^3 - 9x) - (2x^3 - 7x^2 - 3)$

- Example 2 (Subtracting)
 $f(x) = 8x^4 - 3x^3 + 7x$ and
 $g(x) = -4x^3 + 11x^2 + 3x - 1$
 What is the difference: $f(x) - g(x)$?

- Example 3 (Subtracting)
 $(-2x^2 + 5x^5 + 3) - (-5x^5 + 8x^2 + 2x)$

Questions / Big IdeasMultiplying Polynomials (Distribution)

1. Distribute each term of the 1st polynomial into each term of the 2nd polynomial.
2. Combine like terms (use 0 as the coefficient for terms without "like" matches).
3. Re-order in descending order (standard form).

$$(x^2 + 5)(x^2 - 11x + 6)$$

$$x^4 - 11x^3 + 6x^2 + 5x^2 - 55x + 30$$

Combine like terms:

$$x^4 - 11x^3 + 11x^2 - 55x + 30$$

Multiplication (Two Monomials)

- Ex. $(-3t)(5t^4)$
 1. Multiply the coefficients 1st: $(-3t)(5t^4) = -3 \cdot 5 = -15$
 2. Multiply the like variable terms 2nd:
 $(-3t)(5t^4) = t \cdot t^4 = (t) \cdot (t \cdot t \cdot t \cdot t) = t^{1+4} = t^5$
 3. Combine like terms, and write the resulting polynomial: $-15x^5$

Algebraic Distribution (Two Binomials)

- Ex. $(x + 5)(x - 2)$
 1. Multiply the 1st terms of each binomial:
 $(x + 5)(x - 2) = x \cdot x = x^2$
 2. Multiply the 1st term of the 1st binomial with the 2nd term of the 2nd binomial:
 $(x + 5)(x - 2) = x \cdot -2 = -2x$
 3. Multiply the 2nd term of the 1st binomial with the 1st term of the 2nd binomial:
 $(x + 5)(x - 2) = 5 \cdot x = 5x$
 4. Multiply the 2nd terms of each binomial:
 $(x + 5)(x - 2) = 5 \cdot -2 = -10$
 5. Combine like terms, and write the resulting polynomial in descending order:
 $x^2 + 3x - 10$

Questions / Big Ideas**Guided Practice – Multiply the polynomials and simplify.**

- Example 1 (Multiplication)

$$(7x^3y^2) \cdot (-3x^5y)$$

- Example 2 (Multiplication)

$$\left(-\frac{1}{2}ab\right) \cdot (16b^2)$$

- Example 3 (Multiplication)

$$2x(5x - 9)$$

- Example 4 (Multiplication)

$$-6b(b^3 + 2)$$

- Example 5 (Multiplication)

$$(4n - 5)(2n + 3)$$

- Example 5 (Multiplication)

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

Summary: _____

