

Lesson 5.2 Adding & Subtracting Polynomials

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MCA Lesson
5.2

5 **Exponents and Polynomials**



5.2 Adding and Subtracting Polynomials

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What You Will Learn

- ▶ Identify the degrees and leading coefficients of polynomials.
- ▶ Add polynomials using a horizontal or vertical format.
- ▶ Subtract polynomials using a horizontal or vertical

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Basic Definitions 2

A polynomial with only one term is called a monomial.

A polynomial with two unlike terms is called a binomial, and a polynomial with three unlike terms is called a trinomial.

For example, $3x^2$ is a monomial, $-3x + 1$ is a binomial, and $4x^3 - 5x + 6$ is a trinomial.



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Example 1 – Identifying Polynomials

- The expression $3x^4 - 8x + x^{-1}$ is not a polynomial because the third term, x^{-1} , has a negative exponent.
- The expression $x^2 - 3x + 1$ is a polynomial of degree 2 with integer coefficients. trinomial
- The expression $x^3 + 3x^{1/2}$ is not a polynomial because the exponent in the second term, $1/2$, is not an integer.

the exponent in the second term, $5x^{1.5}$, is not an integer.

- d. The expression $-\frac{1}{3}x + \frac{x^3}{4}$ is a polynomial of degree

3 with rational coefficients.

$$\frac{x^3}{4} - \frac{1}{3}x \text{ binomial}$$



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Example 2 – Determining Degrees and Leading Coefficients

Polynomial	Standard Form	Degree	Leading Coefficient
a. $4x^2 - 5x^7 - 2 + 3x$	$-5x^7 + 4x^2 + 3x - 2$	7	-5
b. $4 - 9x^2$	$-9x^2 + 4$	2	-9
c. $2 + x^3 - 5x^2$	$x^3 - 5x^2 + 2$	3	1



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Example 3 – Adding Polynomials Horizontally

a. $(2x^2 + 4x - 1) + (x^2 - 3)$

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

Original polynomials

b. $(x^3 + 2x^2 + 4) + (3x^2 - x + 5)$

Original polynomials

$$x^3 + 5x^2 - x + 9$$

c. $(2x^2 - x + 3) + (4x^2 - 7x + 2) + (-x^2 + x - 2)$

$5x^2 - 7x + 3$



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Example 6 – Subtracting Polynomials Horizontally

a. $(2x^2 + 3) - 1(3x^2 - 4) =$

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

$-x^2 + 7$

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

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

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

 -1 coef.

Distributive Property

Combine like terms.

degree 2

binomial

Original polynomials

Distributive Property

deg. 3
L.C. = 2

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Example 7 – Subtracting Polynomials Vertically

a. $(3x^2 + 7x - 6) - (3x^2 + 7x)$

$$\begin{array}{r} -6 \\ \hline \end{array}$$

Change signs and add.

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

$$\begin{array}{r} \\ \hline \end{array}$$

Change signs and add.

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

c. $(4x^4 - 2x^3 + 5x^2 - 1x + 8) - (3x^4 + 2x^3 - 3x + 4)$

$$x^4 + 5x^2 - 4x + 12$$

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Example 8 – Combining Polynomials Horizontally

a. $(x^2 - 2x + 1) - [(x^2 + x - 3) + (-2x^2 - 4x)]$ Original polynomials

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

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

$$2x^2 + x + 4$$

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Example 8 – Combining Polynomials Horizontally cont'd

b. $(3x^2 - 7x + 2) - (4x^2 + 6x - 1) + (-x^2 + 4x + 5)$

$$3x^2 - 7x + 2 - 4x^2 - 6x + 1 - x^2 + 4x + 5$$

$$-2x^2 - 9x + 8$$

c. $(-2x^2 + 4x - 3) - [(4x^2 - 5x + 8) - 2(-x^2 + x + 3)]$

$$(x^4 + 4x - 3) - (4x^2 - 5x + 8) = x^4 - 4x^2 + 11x - 11$$



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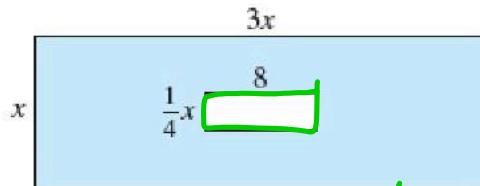
Example 9 – Geometry: Area of a Region

Find an expression for the area of the shaded region.

Perimeter

$$3x + 3x + x + x =$$
$$8x$$

$$3x^2 - 2x$$



Area

A hand-drawn diagram of a rectangle. The top side is labeled with the expression $3x$. The right side is labeled with the variable x .

\$
4x

$$8\left(\frac{1}{4}x\right) = 2x$$



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