

# Section 9.1 Add and Subtract Polynomials

**Goal •** Add and subtract polynomials.

Term	Monomial	Binomial	Trinomial	Polynomial
Parts of an expression that are added together.	A number, variable, <b>OR</b> the product of numbers and one or more variables with <b>WHOLE NUMBER</b> exponents.	A polynomial with two terms	A polynomial with three terms	A monomial <b>OR</b> a sum of monomials
<i>Example:</i> $3x + 4 + 6x$  $3x, 4, 6x$ (separated by addition or subtraction signs)	<i>Example:</i> $10$ $4x$ $5xy^2$	<i>Example:</i> $2x^2 + 3$ $-5xy + z$	<i>Example:</i> $3x^2 - 2x + 5$ $-2x^2 + 5x^3 - x$	<i>Example:</i> $5xy^2 + 4x$ $5x$ $2x^2 - 3$

**Degree of a Monomial** – The sum of the exponents of the variables in a monomial

**Leading Coefficient** – The coefficient of the first term in a polynomial that is written with exponents of a variable decreasing from left to right.

**Example 1:** Write each polynomial so that the exponents decrease from left to right. Identify the degree and leading coefficient of the polynomial.

a.  $7 + 2x^4 - 4x$

$$2x^4 - 4x + 7$$

Degree 4 Leading Coefficient 2

b.  $5x + 13 + 8x^3$

$$8x^3 + 5x + 13$$

Degree 3 Leading Coefficient 8

**Example 2:** Tell whether the expression is a polynomial. If it is a polynomial, find its degree and classify it by the number of terms. Otherwise, tell why it is not a polynomial.

Expression	Polynomial? If so, is it a monomial, binomial, or trinomial?	Classify by degree
$6$	monomial	0
$4a^2b^3 + 6ab^6$	binomial	7
$2w^3 + 4^w$	no	—
$-2x^6$	monomial	6
$-h^3 + 4h^2$	binomial	3
$9 - 5x^2 + 3x$	trinomial	2

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Checkpoint:

1. Write each polynomial in standard form. Identify the degree and leading coefficient of each polynomial.

a.  $4y^4 - 7y^5 + 2y$

$$-7y^5 + 4y^4 + 2y$$

D: 5 LC: -7

b.  $9x^6y^2 - 4xy + 3x + 7$  ★

D: 8 LC: 9

2. Tell whether the expression is a polynomial. If it is, find its degree and classify it by the number of terms. Otherwise, tell why it is not a polynomial.

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

trinomial

$$-x^7 + 5x^3 + 4x$$

D: 7 LC: -1

b.  $v^3 + v^{-2} + 2v$

no; can't have negative exponents

## Adding/Subtracting Polynomials

Vertical Format → Align like terms in vertical columns

Horizontal Format → Group like terms and simplify

Example 3: Add polynomials

(don't add exponents!)

a.  $(-2x^2 + 3x - x^3) + (3x^2 + x^3 - 12)$

$$\begin{array}{r} -x^3 - 2x^2 + 3x \\ + x^3 + 3x^2 + 0 - 12 \\ \hline 0 \quad \boxed{1x^2 + 3x - 12} \end{array}$$

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

$$\begin{array}{r} 4x^3 + 2x^2 + 0 - 4 \\ + x^3 - 3x^2 + x + 0 \\ \hline \boxed{5x^3 - 1x^2 + x - 4} \end{array}$$

Example 4: Subtract polynomials

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

$$\begin{array}{r} 4x^2 + 0 + 5 \\ - 3x^2 + 2x - 8 \\ \hline \boxed{x^2 - 2x + 13} \end{array}$$

b.  $(2x^2 - 7) - (3x^2 - 9x + 1)$

$$\begin{array}{r} 2x^2 + 0 - 7 \\ - 3x^2 - 9x + 1 \\ \hline \boxed{-1x^2 - 9x - 8} \end{array}$$

Checkpoint: Add or subtract each polynomial.

3.  $(3x^2 + x - 6) + (x^2 + 4x + 10)$

$$\begin{array}{r} 3x^2 + x - 6 \\ + x^2 + 4x + 10 \\ \hline 4x^2 + 5x + 4 \end{array}$$

4.  $(12 + 6x^2 - 4x) - (-8x^2 - 4x + 3)$

$$\begin{array}{r} 6x^2 - 4x + 12 \\ - -8x^2 - 4x + 3 \\ \hline 14x^2 - 8x + 15 \end{array}$$