

5.2: Adding and Subtracting Polynomials

Lesson Goals

- Look at an expression and identify like terms.
- Add and subtract polynomials by collecting like terms.

Recall

Like terms are terms that have the same variables and the same exponent with those variables. The coefficients do not need to match.

Definition

Simplify means to combine like terms. We will simplify like terms by adding or subtracting their coefficients.

Example 1

Simplify $(2x + 7) + (4x - 9)$

①

$$\begin{aligned} & 2x + 4x + 7 + (-9) \\ & \underline{\quad\quad\quad} \quad \underline{\quad\quad\quad} \\ & = (2+4)x + (-2) \\ & = 6x - 2 \end{aligned}$$

Your Turn

Simplify $(5x - 7) + (3x + 9)$

$$\begin{array}{r} 5x - 7 \\ 3x + 9 \\ \hline 8x + 2 \end{array}$$

②

$$\begin{array}{r} 2x + 7 \\ 4x - 9 \\ \hline 6x - 2 \end{array}$$

alternative: $(2x + 3x) + (-8x - 9) + x$

Example 2

Simplify $4x^2 + 9x - 2x^2 - 5x$.

①

$$(4-2)x^2 + (9-5)x$$

$$(4x^2 - 2x) + (9x - 5x)$$

$$2x^2 + 4x$$

②

$$\begin{array}{r} 4x^2 + 9x + 0 \\ -2x^2 - 5x + 0 \\ \hline 2x^2 + 4x + 0 \end{array}$$

Subtracting Polynomials

To subtract a number is the same as adding the opposite

$$9 - (+7) = 9 + (-7) = 9 - 7$$

$$8x - (3x) = \underline{8x + (-3x)} = (8 + (-3))x = 5x$$

$$8x - (-3x) = \underline{8x + (3x)} = 11x$$

Negate all terms in a bracket to find its opposite: $0 - (x^2 - 2) = 0 + (-x^2 + 2)$

Example 3

Simplify $0 - (6x + 9)$

$$\begin{aligned} 0 + (-6x - 9) \\ = -6x - 9 \end{aligned}$$

Simplify $(7x + 8) - (6x - 9)$

$$\begin{aligned} (7x + 8) + (-6x + 9) \\ (7-6)x + 8 + 9 \\ = x + 17 \end{aligned}$$

$$\begin{array}{r} 7x + 8 \\ 6x - 9 \\ \hline x + 17 \end{array}$$

You Try This

Simplify $(3x^2 + 5x - 5) - (7x^2 - 2x - 4)$

$$\begin{array}{r} 3x^2 + 5x - 5 \\ - (7x^2 - 2x - 4) \\ \hline -4x^2 + 7x - 1 \end{array}$$

$$\begin{array}{r} 3x^2 + 5x - 5 \\ + (7x^2 + 2x + 4) \\ \hline \end{array}$$

Alternative

Simplify $(8a^2 - 4ab + 2b^2) - (-a^2 - 2ba + 4b^2)$.

Now This

Simplify $(x^2 - 3xy) - (-2x^2 + xy)$

Alternative

Simplify $(3y^3 - y^2 + 4y + 9) + (2y^3 + y^2 - 8y + 11)$

Homework:

Homework: pg 196

#7, 14, 15, 16, 17, 20, 22, 29

Suggested Practice:

Simplify:

a. $3cd^2 + 5cd - 9cd + 4cd^2 + 5d.$

b. $8m^3k^2 + 2m^5k^8 + 4m^5k^8 - m^3k^2 + 3k^2m^3.$

c. $(\frac{3}{4}a + \frac{2}{3}b) - (\frac{1}{2}a - \frac{2}{5}b)$

d. $4x + 2y - (9x - 3y - 5x - 2y)$

$$\textcircled{1} \quad \frac{3}{4}a + \frac{2}{3}b - \frac{1}{2}a + \frac{2}{5}b$$

$$\begin{aligned} \textcircled{2} \quad & \left(\frac{3}{4}a - \frac{1}{2}a\right) + \left(\frac{2}{3}b - \frac{2}{5}b\right) \\ & \left(\frac{3}{4}a - \frac{2}{4}a\right) + \left(\frac{10}{15}b - \frac{8}{15}b\right) \\ & = \frac{1}{4}a + \frac{4}{15}b \end{aligned}$$

Sources: CEMC Open Courseware