

Objective: Add, Subtract and Multiply Polynomials

Concept

**Polynomial:** a sum of monomials where all powers of the variables are whole number exponents and all coefficients are real numbers.

**Monomial:** a real number (called a constant), a variable ( $x, y, a, b$ ), or a product of a real number and one or more variables ( $2x, 3x^2, xy$ )

**Binomial:** the sum or difference of two monomials ( $x + 5, 3x^2 - 2$ )

**Trinomial:** the sum or difference of three monomials ( $x^2 - 3x + 4, 5x^3 + x^2 - x$ )



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**Standard Form:** a polynomial written in descending order of its exponents

**Examples**

$$8x^4 - 2x, x + 3, x^2 - 5x - 2$$

**Non-Examples**

$$8x - 2x^2, 3 - x, x^2 - 5x^3 - 2$$

**Like Terms:** monomials with the same variables to the same exponents; only like terms can be combined using addition and subtraction

**Like Terms**

$$7x \text{ and } 5x$$
$$2x^2 \text{ and } -x^2$$
$$xy \text{ and } 4xy$$

**Unlike Terms**

$$7x \text{ and } 5y$$
$$2x^2 \text{ and } -x$$
$$xy^2 \text{ and } 4x^2y$$





Objective: Add, Subtract and Multiply Polynomials

Ex) Simplify the expression. Write the result in standard form.

Make sure you follow Order of Operations!

① multiply

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

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

$$\begin{array}{ccccccc} & 1+1 & & & & & \\ & \downarrow & & & & & \\ \underline{9x^2} & - \underline{6x} & - \underline{6x^2} & - \underline{14x} & + \underline{4} & & \\ & & & & & & \end{array}$$

②

$$3x^2 - 20x + 4$$



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Ex) Simplify the expression. Write the result in standard form.

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① exponents

② multiply

$$\begin{aligned}
 & -3x(2x-3)^2 \quad \text{first} \\
 & (2x-3)(2x-3) \\
 & 4x^2 - \underline{6x} - \underline{6x} + 9 \\
 & -3x(4x^2 - 12x + 9) \\
 & \quad \begin{array}{cc} 1+2 & 1+1 \\ \downarrow & \downarrow \end{array} \\
 & \boxed{-12x^3 + 36x^2 - 27x}
 \end{aligned}$$



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Ex) Simplify the expression. Write the result in standard form.

Make sure you follow Order of Operations!

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

① exponents

$$(9x^2 - 3x - 3x + 1) - (x^2 + 3x + 3x + 9)$$

$$(9x^2 - 6x + 1) - (x^2 + 6x + 9)$$

② remove parentheses

$$\underline{9x^2} - \underline{6x} + \underline{1} - \underline{1x^2} - \underline{6x} - \underline{9}$$

③

$$\boxed{8x^2 - 12x - 8}$$



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Ex) Simplify the expression. Write the result in standard form.

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

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

$$\begin{array}{r} 9x^3 + 15x^2 - 3x \\ -12x^2 - 20x + 4 \end{array}$$

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$$9x^3 + 3x^2 - 23x + 4$$



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Practice) Simplify the expression. Write the result in standard form.

$$(2x + 7)(x - 1)(x + 3)$$

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

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

$$+ 7x^2 + 14x - 21$$

$$\boxed{2x^3 + 11x^2 + 8x - 21}$$

