

Unit 1

Polynomials

You will study

- Operations & multiplying with polynomials
- Long division
- Factoring polynomial expressions
- The zeros of polynomial functions
- The roots of polynomial equations
- The intercepts of polynomial graphs
- Solving polynomial equations by factoring
- Simplifying Radicals and the Discriminant
- Solving quadratic equations with the Quadratic Formula
- Solving quadratic equations by Completing the Square

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1-1: Operations/Multiplying with Polynomials

Term - *a number or product of numbers and variables: $3xy$*

Monomial - *a single term: 3 , $3xy^2$*

Polynomial - *one or more terms combined as a sum or difference of terms: $3 + 3xy^2$*

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$$-9x^0 = -9$$

Classifying Polynomials

- A polynomial can be named by its # terms and degree.

largest exponent in the polynomial

Classifying Polynomials by Degree			
Name	Degree	Example	# Terms
Constant	0	-9	1
Linear	1	$x - 4$	2
Quadratic	2	$x^2 + 3x - 1$	3
Cubic	3	$x^3 + 2x^2 + x + 1$	4

Standard Form (Descending order of exponents)

Leading coefficient

Degree of polynomial

$$5x^3 + 8x^2 + 3x - 17$$

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Adding and Subtracting Polynomials

Add or subtract. Write your answer in standard form.

PEMDAS

$$1. (3x^2 + x + 7) + (14x^3 + x^2 - x + 2) = \underline{3x^2 + x + 7} + \underline{14x^3 + x^2 - x + 2}$$

$$= \underline{4x^2 + 9 + 14x^3}$$

$$= \underline{14x^3 + 4x^2 + 9}$$

$$2. (2x^3 + 9 - x) + (5x^2 + 4 + 7x + x^3)$$

$$= \underline{2x^3 + 0x^2 - x + 9}$$

$$+ \underline{x^3 + 5x^2 + 7x + 4}$$

$$= \underline{3x^3 + 5x^2 + 6x + 13}$$

$$3. (1 - x^2) - (3x^2 + 2x - 5) = \underline{1 - x^2 - 3x^2 - 2x + 5}$$

$$= \underline{-4x^2 - 2x + 6}$$

$$4. (5x^3 + 6x^2 + 12) - (15x^2 + 3x - 2) = \underline{5x^3 + 6x^2 + 12 - 15x^2 - 3x + 2}$$

$$= \underline{5x^3 - 9x^2 - 3x + 14}$$

second first

$$5. \text{Subtract } (x^2 - x + 6) \text{ from } (3 - 2x^2).$$

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

$$= \underline{3 - 2x^2 - x^2 + x - 6}$$

$$= \underline{-3x^2 + x - 3}$$

$$6. \text{From } (x^2 - x + 6) \text{ subtract } (3 - 2x^2).$$

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

$$= \underline{x^2 - x + 6 - 3 + 2x^2}$$

$$= \underline{3x^2 - x + 3}$$

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Multiplying Polynomials

- Remember $(x^a)(x^b) = x^{a+b}$

1. $x(x^3) = x^4$

2. $3x^2(x^5) = 3x^7$

3. $xy(7x^2) = 7x^3y$

4. $3y^2(-3y) = -9y^3$

Multiplying a monomial and a polynomial:

To multiply a polynomial by a monomial, use the distributive property and the properties of exponents.

1. $3x^2(x^3 + 4) = 3x^5 + 12x^2$

2. $ab(a^3 + 3ab^2 - b^3) = a^4b + 3a^2b^3 - ab^4$

You try these:

3. $3cd^2(4c^2d - 6cd + 14cd^2) = 12c^3d^3 - 18c^2d^3 + 42c^2d^4$

4. $-x^2y(6y^3 + y^2 - 28y + 30) = -6x^2y^4 - x^2y^3 + 28x^2y^2 - 30x^2y$

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Multiplying a binomial and a binomial:

To multiply a binomial by a binomial, use the distributive property and multiply each term in the second polynomial by each term in the first. This is double distribution.

1. $(2x - 3)(x + 5) = 2x^2 + 10x - 3x - 15$
 $= 2x^2 + 7x - 15$

You try:

2. $(4a - 3b)(a + 3b) = 4a^2 + 12ab - 3ab - 9b^2$
 $= 4a^2 + 9ab - 9b^2$

Multiplying polynomials:

To multiply two polynomials, use double distribution. Remember this uses the distributive property to multiply each term in the second polynomial by each term in the first.

Examples:

1. $(a - 3)(2 - 5a + a^2) = a(2 - 5a + a^2) - 3(2 - 5a + a^2)$
 $= 2a - 5a^2 + a^3 - 6 + 15a - 3a^2$
 $= a^3 - 8a^2 + 17a - 6$

2. $(x - 2)(1 + 3x - x^2) = x(1 + 3x - x^2) - 2(1 + 3x - x^2)$
 $= x + 3x^2 - x^3 - 2 - 6x + 2x^2$
 $= -x^3 + 5x^2 - 5x - 2$

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You try these:

$$\begin{aligned}
 3. (y^2 + 2y - 12)(x + 2) &= (x + 2)(y^2 + 2y - 12) \\
 &= x(y^2 + 2y - 12) + 2(y^2 + 2y - 12) \\
 &= xy^2 + 2y^2 + 2xy - 12x + 4y - 24
 \end{aligned}$$

$$4. (2x - 3)(x^5 - 4x^3 + 7) = 2x^6 - 3x^5 - 8x^4 + 12x^3 + 14x^2 - 21$$

Multiply $(x - 1)(x^4 + x^3 + x^2 + x + 1)$ and combine like terms. Explain how you reached your answer.

$$\begin{aligned}
 &x^5 + x^4 + x^3 + x^2 + x - x^4 - x^3 - x^2 - x - 1 \\
 &= x^5 - 1
 \end{aligned}$$

Your assignment is Homework Worksheet 1-1 in your homework packet

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