4.2 Adding, Subtracting, and Multiplying Polynomials

Example 1: Adding Polynomials

Add $3x^3 + 2x^2 - x - 7$ and $x^3 - 10x^2 + 8$

Example 2: Subtracting Polynomials

Subtract $2x^3 + 6x^2 - x + 1$ from $8x^3 - 3x^2 - 2x + 9$

Example 3: Multiplying Polynomials

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

Example 4: Multiplying Three Binomials

Multiply $x - 1, x + 4, and\ x + 5$

Example 5: Proving a Polynomial Identity

Expand the following: $(a + b)^3$

Key Notes!!!

Core Concept

Special Product Patterns

Sum and Difference

$(a + b)(a - b) = a^2 - b^2$ $\quad (x + 3)(x - 3) = x^2 - 9$

Square of a Binomial

$(a + b)^2 = a^2 + 2ab + b^2$ $\quad (y + 4)^2 = y^2 + 8y + 16$

$(a - b)^2 = a^2 - 2ab + b^2$ $\quad (2t - 5)^2 = 4t^2 - 20t + 25$

Cube of a Binomial	Example
$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$	$(z + 3)^3 = z^3 + 9z^2 + 27z + 27$
$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$	$(m - 2)^3 = m^3 - 6m^2 + 12m - 8$

Example 6: Using Special Product Patterns

Find each product.

a. $(4n + 5)(4n - 5)$ **b.** $(9y - 2)^2$ **c.** $(ab + 4)^3$

Critical thinking! Try to continue the following pattern

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1

What would this row be? →

Core Concept

Pascal's Triangle

In Pascal's Triangle, the first and last numbers in each row are 1. Every number other than 1 is the sum of the closest two numbers in the row directly above it. The numbers in Pascal's Triangle are the same numbers that are the coefficients of binomial expansions, as shown in the first six rows.

	n	$(a + b)^n$	Binomial Expansion	Pascal's Triangle
0th row	0	$(a + b)^0 =$	1	1
1st row	1	$(a + b)^1 =$	$1a + 1b$	1 1
2nd row	2	$(a + b)^2 =$	$1a^2 + 2ab + 1b^2$	1 2 1
3rd row	3	$(a + b)^3 =$	$1a^3 + 3a^2b + 3ab^2 + 1b^3$	1 3 3 1
4th row	4	$(a + b)^4 =$	$1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4$	1 4 6 4 1
5th row	5	$(a + b)^5 =$	$1a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + 1b^5$	1 5 10 10 5 1

Example 7: Using Pascal's Triangle to Expand Binomials

Expand $(x-2)^5$

Try on your own!

Expand $(3y+1)^4$

Classwork/Homework
5, 11, 15, 17, 20, 22, 28, 47, 52