9.2 Multiply Polynomials

Goal • Multiply polynomials.

Your Notes

Review

① $x^2 + x^2 = \boxed{2x^2}$

② $x^2 \cdot x^3 = \boxed{x^5}$

③ $(x^2)^4 = \boxed{x^8}$

④ $\frac{x^4}{x^2} = \boxed{x^2}$

Example 1 Multiply a monomial and a polynomial

Find the product $3x^3(2x^3 - x^2 - 7x - 3)$.

Solution

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

mental step → $= 3x^3(2x^3) + 3x^3(-x^2) + 3x^3(-7x) + 3x^3(-3)$

$= 6x^6 - 3x^5 - 21x^4 - 9x^3$

Example 2 Multiply polynomials vertically and horizontally

Find the product.

QUADRATIC (D=2) TRINOMIAL
LINEAR (D=1) BINOMIAL

a. $(a^2 - 6a - 3)(2a - 5)$ b. $(3b^2 - 2b + 5)(5b - 6)$

Solution

a. $(2a - 5)(a^2 - 6a - 3)$

$= 2a^3 - 12a^2 - 6a$
$\quad - 5a^2 + 30a + 15 =$

$\boxed{2a^3 - 17a^2 + 24a + 15}$

Remember that the terms of $(2a - 5)$ are $2a$ and -5. They are *not* $2a$ and 5.

OPTION 1

Commute the factors

$a \cdot b = b \cdot a$

b. $(3b^2 - 2b + 5)(5b - 6)$

$= 15b^3 - 10b^2 + 25b$
$\quad - 18b^2 + 12b - 30 =$

$\boxed{15b^3 - 28b^2 + 37b - 30}$

OPTION 2

Distribute Backwards

Your Notes

Checkpoint Find the product.

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

$2x^5 - 10x^4 + 6x^3 - 14x^2$

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

$2a^3 + 10a^2 - 8a$
$+ 3a^2 + 15a - 12 =$

$2a^3 + 13a^2 + 7a - 12$

OPTION 1

Double Distribution

Example 3 ***Multiply binomials using the FOIL pattern***

Find the product $(2c + 7)(c - 9)$. ← 2 LINEAR BINOMIALS

Solution

$(2c + 7)(c - 9)$

$= 2c(\underline{c}) + 2c(\underline{-9}) + 7(\underline{c}) + 7(\underline{-9})$

$=$ FIRST OUTER INNER LAST

$= 2c^2 - 18c + 7c - 63$ ← SIMPLIFY

$2c^2 - 11c - 63$

OPTION 2

FIRST TERMS

OUTER " "

INNER " "

LAST " "

Checkpoint Complete the following exercise.

3. Find the product $(m + 3)(5m - 4)$.

$5m^2 - 4m + 15m - 12 =$

$5m^2 + 11m - 12$

4. Do mentally

$(x + 10)(2x - 5) = 2x^2 + 15x - 50$