Objective: Multiply Polynomials of Higher Degree

Concept

Recall the way variable powers are multiplied using the Product of Powers Property: $x^n \cdot x^m = x^{n+m}$

Ex) Simplify each product. Write the result in standard form.

$(9x^5y^4)(-5x^3y)$

$9 \cdot -5 \cdot x^{5+3} \cdot y^{4+1}$

$-45 \cdot x^8 \cdot y^5$

$-45x^8y^5$

$-2x^2y^6z(5x^7z)$

$-2 \cdot 5 \cdot x^{2+7} \cdot y^6 \cdot z^{1+1}$

$-10 \cdot x^9 \cdot y^6 \cdot z^2$

$-10x^9y^6z^2$

Objective: Multiply Polynomials of Higher Degree

Ex) Simplify each product. Write the result in standard form.

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

↓

① $(x^2-3)(x^2-2x+1)$

② $x^2(x^2-2x+1) + -3(x^2-2x+1)$

$x^4 - 2x^3 + 1x^2 + -3x^2 + 6x - 3$

③ $\boxed{x^4 - 2x^3 - 2x^2 + 6x - 3}$

"quartic polynomial"

Objective: Multiply Polynomials of Higher Degree

Ex) Simplify each product. Write the result in standard form.

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

① $(x^3 - 3x + 1)(5x^2 - x + 2)$

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

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

$-15x^3 + 3x^2 - 6x$

$+ 5x^2 - 1x + 2$

③ $5x^5 - x^4 - 13x^3 + 8x^2 - 7x + 2$

"quintic polynomial"

Objective: Multiply Polynomials of Higher Degree

Ex) Simplify each product. Write the result in standard form.

$$(3x - 4y)(2x^2 - xy + 7y^2)$$

① $3x(2x^2 - 1xy + 7y^2) + -4y(2x^2 - 1xy + 7y^2)$

$6x^3 - 3x^2y + 21xy^2$

$-8x^2y + 4xy^2 - 28y^3$

② $\boxed{6x^3 - 11x^2y + 25xy^2 - 28y^3}$

Objective: Multiply Polynomials of Higher Degree

Ex) Simplify each product. Write the result in standard form.

Concept

Multiplication is a binary operation. This means only two factors can be multiplied at a time.

$$(3x-4y)^3$$

① $(3x-4y)(3x-4y)(3x-4y)$

$9x^2-12xy$
$-12xy+16y^2$

② $(3x-4y)(9x^2-24xy+16y^2)$

$27x^3-72x^2y+48xy^2$
$-36x^2y+96xy^2-64y^3$

③ $\boxed{27x^3-108x^2y+144xy^2-64y^3}$

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Closure

A student simplified the problem below. Explain the error the student made.

$$\begin{aligned} & (x+2)^3 \\ = & (x)^3+(2)^3 \\ = & \boxed{x^3+8} \end{aligned}$$

The error is that the student applied the power of a power rule, $(x^n)^m = x^{mn}$, instead of multiplying the binomial times itself three times: $(x+2)(x+2)(x+2)$ which would require the distributive property.