Objective: Add and Subtract Polynomials of Higher Degree

Concept

To add two terms together they must be like terms. To be like terms the powers on all variable factors must be the same. A new term is created by adding the coefficients.

<table>
<tr><td align="center">Like Terms</td><td align="center">Unlike Terms</td></tr>
<tr>
<td align="center">$4x^2y^3 + 8x^2y^3 = 12x^2y^3$</td>
<td align="center">$4x^2 + 6x^2y$</td>
</tr>
<tr>
<td align="center">$-9x^6 - 2x^6 = -11x^6$</td>
<td align="center">$-2x^3y^2 + 5x^3y^3$</td>
</tr>
<tr>
<td></td>
<td align="center">$4x^2y^3 - 8xy^3$</td>
</tr>
</table>

Standard Form is determined by the variable that is first in alphabetical order. Terms with the same power of the first variable are put in standard form using the procedure: the term with no second variable followed by terms with a second variable power in descending order.

Standard Form: $x^8 + 3x^8y - 2x^6y^2 + 7x^6y$

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

$$(4x^2 - x^3 + 2 + 5x^4) + (-x + 6x^2 + 3x^4)$$

Horizontal Format

$$5x^4 - x^3 + 4x^2 + 2 \quad + \quad 3x^4 + 6x^2 - x$$

$$\boxed{8x^4 - x^3 + 10x^2 - x + 2}$$

Vertical Format

$$5x^4 - x^3 + 4x^2 \qquad + 2$$
$$3x^4 \qquad + 6x^2 - x$$

$$\boxed{8x^4 - x^3 + 10x^2 - x + 2}$$

Objective: Add and Subtract Polynomials of Higher Degree

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

$$(-2x^3y^2 + 2x^2y + 5x - 6y) + (x^3 - x^3y^2 + 6x^2y + 3x + 2)$$

In "like terms" all variable factors must have the same exponents.

$$-2x^3y^2 + 2x^2y + 5x - 6y + x^3 - x^3y + 6x^2y + 3x + 2$$

$$x^3 - 2x^3y^2 - x^3y + 8x^2y + 8x - 6y + 2$$

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

$$(5x - 18x^7 - 2x^4 + 3x^9) - (11x^4 + 7 - 5x + 4x^9)$$

Horizontal Format

$$3x^9 - 18x^7 - 2x^4 + 5x - 11x^4 - 7 + 5x - 4x^9$$

$$-x^9 - 18x^7 - 13x^4 + 10x - 7$$

Vertical Format

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

$$(34x^5y - 9xy - 13x^7y^3) - (2x^7y^3 - 10x + 16x^5y - 12)$$

$$34x^5y - 9xy - 13x^7y^3 - 2x^7y^3 + 10x - 16x^5y + 12$$

$$-15x^7y^3 + 18x^5y + 10x - 9xy + 12$$

Objective: Add and Subtract Polynomials of Higher Degree

Closure

Explain why you change the signs of the second polynomial when subtracting.

$$(10x - 4x + 3x^{11}) - (9x^4 + 12 - 7x)$$

You change the signs of the second polynomial when subtracting because to combine like terms the problem must be converted to addition, and subtracting is equivalent to adding the opposite.