Secondary III H 7-1 HW
Operations with Polynomials

Name: Answer Key

1. Write the polynomial $-23x^7 + x^9 - 6x^3 + 10 + 2x^2$ in standard form, and then identify the degree and leading coefficient.

$x^9 - 23x^7 - 6x^3 + 2x^2 + 10$

degree = 9 leading coefficient = 1

Add or subtract the polynomials.

2. $(82x^8 + 21x^2 - 6) + (18x + 7x^8 - 42x^2 + 3)$

$7x^8 - 42x^2 + 3$

$89x^8 - 21x^2 - 3$

3. $(-2x + 23x^5 + 11) - (5 - 9x^3 + x)$

$-x \quad -5 \quad +9x^3$

$23x^5 + 9x^3 - 3x + 6$

4. $(x^4 - 7x^3 + 2 - x) + (2x^3 - 3) + (1 - 5x^3 - x^4 + x)$

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

$-5x^3 + 1$

$-10x^3$

5. $(10x^2 - x + 4) - (5x + 7) + (6x - 11)$

$-5x - 7 \quad -5x - 7 \quad +6x - 11$

$+6x - 11$

$10x^2 - 14$

6. $(9x - 12x^3) - (5x^3 + 7x - 2)$

$-7x - 5x^3 \quad -5x^3 - 7x + 2$

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

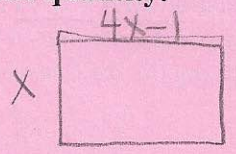
7. $(15x - 121x^{12} + x^9 - x^7 + 3x^2) + (x^7 - 68x^2 - x^9)$

$-x^9 + x^7 - 68x^2$

$-121x^{12} - 65x^2 + 15x$

Find the polynomial that models the problem and use it to estimate the quantity.

8. Cho is making a garden, where the length is x feet and the width is $4x - 1$ feet. He wants to add garden stones around the perimeter of the garden once he is done. If the garden is 4 feet long, how many feet will Cho need to cover with garden stones?



$P = 2(x + 4x - 1)$
$= 2(5x - 1)$
$= 10x - 2$

if $x = 4$ then
$P = 10(4) - 2$
$= 38$ ft

9. **Business** From data gathered in the period 2008–2012, the yearly amount of U.S. exports can be modeled by the function $E(x) = -228x^3 + 2552.8x^2 - 6098.5x + 11{,}425.8$, where x is the number of years after 2008 and $E(x)$ is the amount of exports in billions of dollars. The yearly amount of U.S. imports can be modeled by the function $I(x) = -400.4x^3 + 3954.4x^2 - 11{,}128.8x + 17{,}749.6$, where x is the number of years after 2008 and $I(x)$ is the amount of imports in billions of dollars. Estimate the total amount the United States imported and exported in 2012.

2012
- 2008
$4 = x$

$E(x) + I(x) = -228x^3 + 2552.8x^2 - 6098.5x + 11425.8$
$-400.4x^3 + 3954.4x^2 - 11128.8x + 17749.6$
$= -628.4x^3 + 6507.2x^2 - 17227.3x + 29175.4$

$E(4) + I(4)$
$= \$24{,}163.8$ billion.

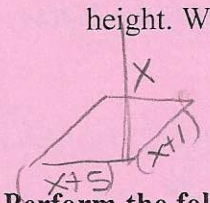
10. **Explain the Error** Colin simplified $(16x + 8x^2y - 7xy^2 + 9y - 2xy) - (-9xy + 8xy^2 + 10x^2y + x - 7y)$. His work is shown below. Find and correct Colin's mistake.

$(16x + 8x^2y - 7xy^2 + 9y - 2xy) - (-9xy + 8xy^2 + 10x^2y + x - 7y)$
$= (16x + 8x^2y - 7xy^2 + 9y - 2xy) + (9xy - 8xy^2 - 10x^2y - x + 7y)$
$= (16x - x) + (8x^2y - 7xy^2 - 8xy^2 - 10x^2y) + (9y + 7y) + (-2xy + 9xy)$
$= 15x - 17x^2y^2 + 16y + 7xy$

x^2y is not the same as xy^2

$= 15x - 2x^2y - 15xy^2 + 16y + 7xy$

11. The dimensions for a rectangular prism are $x+5$ for the length, $x+1$ for the width, and x for the height. What is the volume of the prism?



$V = l \times w \times h$

$= (x+5)(x+1)x$

$= (x^2+6x+5)\cdot x$

$= x^3+6x^2+5x$

Perform the following polynomial multiplications.

12. $(2x+5y)(3x^2-4xy+2y^2)$

$= 6x^3 - 8x^2y + 4xy^2 + 15x^2y - 20xy^2 + 10y^3$

$= 6x^3 + 7x^2y - 16xy^2 + 10y^3$

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

$x^5 - x^4 - 5x^3$

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

$x^2 - x - 5$

$x^5 - 6x^3 - 4x^2 - x - 5$

14. **Biology** A biologist has found that the number of branches on a certain rare tree in its first few years of life can be modeled by the polynomial $b(y) = 4y^2 + y$. The number of leaves on each branch can be modeled by the polynomial $l(y) = 2y^3 + 3y^2 + y$, where y is the number of years after the tree reaches a height of 6 feet. Write a polynomial describing the total number of leaves on the tree.

$b(y) \cdot l(y) = (4y^2+y)(2y^3+3y^2+y)$

$= 8y^5 + 12y^4 + 4y^3$

$+ 2y^4 + 3y^3 + y^2$

$= 8y^5 + 14y^4 + 7y^3 + y^2$

Verify the given polynomial identity.

15. $(x+y+z)^2 = x^2 + y^2 + z^2 + 2xy + 2xz + 2yz$

$(x+y+z)(x+y+z) = x^2 + xy + xz$

$+ xy + y^2 + yz$

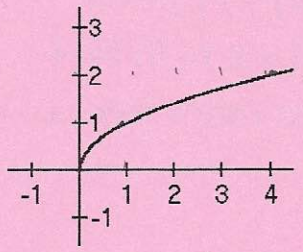
$+ xz + yz + z^2$

$= x^2 + y^2 + z^2 + 2xy + 2xz + 2yz$ = Right Side

Review

16. Name and write an equation to represent each parent function.

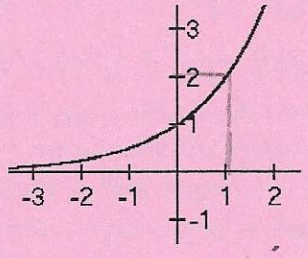
a.



Name: Radical

Equation: $y = \sqrt{x}$

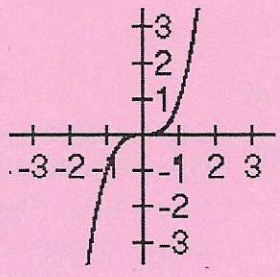
b.



Name: Exponential

Equation: $y = 2^x$

c.



Name: Cubic

Equation: $y = x^3$