

# 5.1 Practice – Operations on Polynomials

Name: Solutions

Pre-Calculus

## Name the degree and leading coefficient.

1.  $5a^2 - 2a^3 - 5a - 2a^5 - 5a^4$

Degree: 5  
Leading Coefficient: -2

2.  $8k^2 - 2 + k + 9k^3$

Degree: 3  
Leading Coefficient: 9

3.  $6x^4 + x^5 - 9x^3 + 4$

Degree: 5  
Leading Coefficient: 1

## Simplify each expression.

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

$7p^3 + 3p^2 - p + 5p^3 + 2p^2$   
 $12p^3 + 5p^2 - p$

5.  $(6n^4 - 2n) + (3n^2 - 2n^4 - n)$

$4n^4 + 3n^2 - 3n$

6.  $(2v^2 - 3v^4 + 4) + (1 - 2v^4 - 5v^2)$

$-5v^4 - 3v^2 + 5$

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

$3 + 4x^4 - 7x^4 - 3x^2 - 1 + 4x^4 + 3$   
 $x^4 - 3x^2 + 5$

8.  $(8m + 6)(m^2 - 6m - 8)$

$8m^3 - 48m^2 - 64m + 6m^2 - 36m - 48$   
 $8m^3 - 42m^2 - 100m - 48$

9.  $(5u^2 - 7v^2)(5u^2 + 7v^2)$

$25u^4 + 35u^2v^2 - 35u^2v^2 - 49v^4$   
 $25u^4 - 49v^4$

10.  $(8x - 5y^3)^2$

$(8x - 5y^3)(8x - 5y^3)$   
 $64x^2 - 40xy^3 - 40xy^3 + 25y^6$   
 $64x^2 - 80xy^3 + 25y^6$

11.  $(6n^2 - 8n - 3)(8n - 6)$

$48n^3 - 36n^2 - 64n^2 + 48n - 24n + 18$   
 $48n^3 - 100n^2 + 24n + 18$

## Factor each completely.

12.  $7x^4 + 11x^3 - 30x^2$

$x^2(7x^2 + 11x - 30)$   
 $x^2(7x^2 - 10x + 21x - 30)$   
 $x^2(x(7x - 10) + 3(7x - 10))$   
 $x^2(7x - 10)(x + 3)$

13.  $5x^2 - 9x - 18$

$5x^2 + 6x - 15x - 18$   
 $x(5x + 6) - 3(5x + 6)$   
 $(5x + 6)(x - 3)$

14.  $-9p^4 - 42p^3 + 72p^2$

$-3p^2(3p^2 + 14p - 24)$   
 $-3p^2(3p^2 + 18p - 4p - 24)$   
 $-3p^2(3p(p + 6) - 4(p + 6))$   
 $-3p^2(p + 6)(3p - 4)$

15.  $9x^2 - 16$

$(3x - 4)(3x + 4)$

16.  $x^2 + 16$

not factorable

17.  $125w^2 - 80$

$5(25w^2 - 16)$   
 $5(5w - 4)(5w + 4)$

18.  $5x^4 + 30x^2 - 200$

$$5(x^4 + 6x^2 - 40)$$

$$5(x^2 + 10)(x^2 - 4)$$

$$5(x^2 + 10)(x - 2)(x + 2)$$

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

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

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

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

20.  $30u^6 + 6u^3 - 108$

$$6(5u^6 + u^3 - 18)$$

$$6(5u^6 + 10u^3 - 9u^3 - 18)$$

$$6(5u^3(\underline{u^3 + 2}) - 9(\underline{u^3 + 2}))$$

$$6(u^3 + 2)(5u^3 - 9)$$

21.  $42n^3 + 48n^2 - 49n - 56$

$$6n^2(\underline{7n + 8}) - 7(\underline{7n + 8})$$

$$(7n + 8)(6n^2 - 7)$$

22.  $12xy - 16x^2 + 21y - 28x$

$$4x(\underline{3y - 4x}) + 7(\underline{3y - 4x})$$

$$(3y - 4x)(4x + 7)$$

23.  $7k + 5k^3 - 35k^2 - 49$

$$k(\underline{7 + 5k^2}) - 7(\underline{5k^2 + 7})$$

$$(5k^2 + 7)(k - 7)$$

Solve each equation using your new factoring abilities! Find ALL the solutions. Hint: don't forget to use the quadratic formula if a quadratic expression does not factor.

24.  $x^3 + 2x^2 = -10x$

$$x^3 + 2x^2 + 10x = 0$$

$$x(x^2 + 2x + 10) = 0$$

$$x = 0 \text{ or } x^2 + 2x + 10 = 0$$

$$x = \frac{-2 \pm \sqrt{2^2 - 4(1)(10)}}{2(1)}$$

$$x = -1 \pm 3i$$

25.  $x^3 = 6x^2 + x$

$$x^3 - 6x^2 - x = 0$$

$$x(x^2 - 6x - 1) = 0$$

$$x = 0 \text{ or } x^2 - 6x - 1 = 0$$

$$x = \frac{6 \pm \sqrt{36 - 4(1)(-1)}}{2(1)}$$

$$x = 3 \pm \sqrt{10}$$

26.  $x^6 - 5x^4 = x^2 - 5$

$$x^6 - 5x^4 - x^2 + 5 = 0$$

$$x^4(x^2 - 5) - (x^2 - 5) = 0$$

$$(x^2 - 5)(x^4 - 1) = 0$$

$$(x^2 - 5)(x^2 - 1)(x^2 + 1) = 0$$

$$(x^2 - 5)(x - 1)(x + 1)(x^2 + 1) = 0$$

$$x = \sqrt{5}, -\sqrt{5}, 1, -1, i, -i$$

27.  $x^4 + 6x^2 = 27$

$$x^4 + 6x^2 - 27 = 0$$

$$(x^2 - 3)(x^2 + 9) = 0$$

$$x^2 = 3 \text{ or } x^2 = -9$$

$$x = \pm\sqrt{3} \text{ or } x = \pm 3i$$

$$28. x^5 - x = 0$$

$$x(x^4 - 1) = 0$$

$$x(x^2 - 1)(x^2 + 1) = 0$$

$$x(x - 1)(x + 1)(x^2 + 1) = 0$$

$$x = 0, 1, -1, i, -i$$

$$29. x^3 + 4x^2 + 3x = 0$$

$$x(x^2 + 4x + 3) = 0$$

$$x(x + 3)(x + 1) = 0$$

$$x = 0, -3, -1$$

**Skills Review:** Find the  $x$ - and  $y$ -intercepts for each function. SHOW ALL WORK!

$$1. -3x + y = -7$$

$x$ -int:

$$-3x + (0) = -7$$

$$-3x = -7$$

$$x = \frac{7}{3}$$

$y$ -int:

$$-3(0) + y = -7$$

$$y = -7$$

$$2. f(x) = \frac{x^2 + 2x}{2x^2 - 2x - 4}$$

$x$ -int:

$$0 = \frac{x^2 + 2x}{2x^2 - 2x - 4}$$

$$0 = x^2 + 2x$$

$$0 = x(x + 2)$$

$$x = 0 \text{ or } x = -2$$

$y$ -int:

$$y = \frac{0 + 0}{0 - 0 - 4}$$

$$y = \frac{0}{-4}$$

$$y = 0$$