Name _____ Date _____ Class _____

LESSON 6-6

Practice A

Fundamental Theorem of Algebra

Identify the number of zeros for each function.

1. $P(x) = x^3 + 2x^2 - 12x + 1$

2. $P(x) = 2x^5 - 5x + 10$

3. $P(x) = 3x^4 + 2x$

Write the simplest polynomial function with the given zeros.

4. –1, 0, and 2

   a. Write the factored expression. _____

   b. Multiply the first two factors. _____

   c. Multiply the result by the remaining factor. _____

   d. Combine like terms. _____

5. –3, 1, and 5

6. –4, –1, and 1

7. $2i$

   a. How many zeros does this function have? _____

   b. Write the conjugate pair for the complex root. _____

   c. Write the factored expression. _____

   d. Multiply the binomials. _____

8. –2 and $\sqrt{3}$

9. 3 and $2 + i$

Solve the equation by finding all roots.

10. $x^3 - 6x^2 - 2x + 12 = 0$

b. ±1, ±2, ±4, ±8

c. 2, $\frac{-3 \pm i\sqrt{7}}{2}$; no, 2 of the roots are irrational numbers.

d. 2 m wide, 4 m long, and 1 m deep

Practice C

1. –5, 0, 7
2. 0, 3, 4
3. $x = 2$ with multiplicity 3
4. $x = -4$ with multiplicity 2; $x = -2$ with multiplicity 1
5. –8, 0, 6
6. 3, 6, $2 \pm \sqrt{3}$
7. –3, 0, 1
8. –3, 1, $-3 \pm \sqrt{11}$
9. a. $2x^3 - 4x^2 - 64 = 0$

   b. ±1, ±2, ±4, ±8, ±16, ±32, ±64

   c. 4, $-1 \pm i\sqrt{7}$; no, 2 of the roots are irrational numbers.

   d. 4 in. wide, 8 in. long, and 2 in. deep

Reteach

1. $3x^4(x - 5)(x + 2)$; –2, 0, 5
2. $x^2(x^2 - 5x + 6)$; $x^2(x - 2)(x - 3)$; 0, 2, 3
3. $2x(x^2 - 3x - 18)$; $2x(x - 6)(x + 3)$; –3, 0, 6
4. $2x^4(x^2 - 16)$; $2x^4(x + 4)(x - 4)$; –4, 0, 4
5. a. ±1, ±3, ±5, ±15

   b. 3 or 5

$\frac{p}{q}$	Coefficients of the Equation			
	1	–7	7	15
1	1	6	13	28
3	1	–4	–5	0
5	1	–2	–3	0

   c. $(x - 3)(x^2 - 4x - 5) = 0$; $(x - 3)(x - 5)(x + 1) = 0$

   d. $x = 3$ or $x = 5$ or $x = -1$

Challenge

1. $y = (x + 3)(x)(x - 4)$
2. $y = -(x + 1)^2(x - 1)(x - 3)$
3. $y = (x + 5)(x + 2)^2\left(x - \frac{1}{2}\right)(x - 3)$
4. $y = (x + 6)^2(x)(x - 1)(x - 3)^2(x - 4)^2$
5. $y = (x + 3i)(x - 3i)(x - 1)^2\left(x - \left(1 + \sqrt{3}\right)\right)\left(x + \left(1 + \sqrt{3}\right)\right)$

Problem Solving

1. $V = w(w + 10)(w - 14)$
2. $w^3 - 4w^2 - 140w - 76{,}725 = 0$
3. No; yes; no

   The constant term is 76,725, which is not a multiple or 4 or 10, but is a multiple of 5.
4. Students should test possible roots that are multiples of 5 but not multiples of 10, such as 35, 45, and 55.
5. C
6. A

Reading Strategies

1. Substitute the value of the root in the function and see if it equals 0.
2. $(x - 3)$ and $(x + 2)$
3. a. $(x + 4)$

   b. 3 times
4. $4x$, $(x - 3)$, $(x + 3)$; –3, 0, 3
5. $-x$, $(x - 5)$, $(x - 1)$; 0, 1, 5
6. $(x + 2)$, $(x + 2)$, $(x - 2)$; –2, 2

LESSON 6-6

Practice A

1. 3
2. 5
3. 4
4. a. $P(x) = x(x + 1)(x - 2)$

   b. $P(x) = (x^2 + x)(x - 2)$

   c. $P(x) = x^3 - 2x^2 + x^2 - 2x$

   d. $P(x) = x^3 - x^2 - 2x$
5. $P(x) = x^3 - 3x^2 - 13x + 15$
6. $P(x) = x^3 + 4x^2 - x - 4$
7. a. 2

   b. $2i$, $-2i$

c. $P(x) = (x + 2i)(x - 2i)$

d. $P(x) = x^2 + 4$

8. $P(x) = x^3 + 2x^2 - 3x - 6$
9. $P(x) = x^3 - 7x^2 + 17x - 15$
10. $x = 6, \pm\sqrt{2}$

Practice B

1. $P(x) = x^3 - 2x^2 - 11x + 12$
2. $P(x) = x^3 - \frac{7}{2}x^2 - \frac{17}{2}x + 5$
3. $P(x) = x^5 - 4x^4 + x^3 - 4x^2 - 12x + 48$
4. $P(x) = x^5 + 5x^4 + 7x^3 + 35x^2 - 18x - 90$
5. $x = i, -i, -3$, and 5
6. $x = 2, -2, 2i$, and $-2i$
7. $x = -4i, 4i, 2$, and -6
8. $x = -3i, 3i$, and -3
9. $V(t) = t^3 - 10t^2 + 23t - 14$

Practice C

1. $P(x) = x^3 - \frac{17}{4}x^2 - \frac{39}{4}x - \frac{9}{2}$
2. $P(x) = x^4 - 9x^3 + 39x^2 - 225x + 350$
3. $P(x) = x^4 + 4x^3 + 4x^2 + 4x + 3$
4. $P(x) = x^5 - 4x^4 - 2x^3 + 8x^2 - 24x + 96$
5. $x = -\frac{3}{2}i, \frac{3}{2}i$, 3, and -1
6. $x = i\sqrt{3}$, $-i\sqrt{3}$, 1, and -4
7. $x = 1 + i, 1 - i, -3$, and 4
8. $x = 2i, -2i$, and -6 9. 3 inches

Reteach

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

   $x^3 + 4x^2 - 5x - 2x^2 - 8x + 10$

   $x^3 + 2x^2 + 13x + 10$
2. $(x^2 + 3x)(x + 1)$

   $x^3 + 3x^2 + x^2 + 3x$

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

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

   $x^3 - 10x^2 + 29x - 20$
4. $(x + 2)(x - 3)(x - 6)$

   $(x^2 - x - 6)(x - 6)$

   $x^3 - 7x^2 + 36$
5. $(x - 2)(x - 4)(x - 6)$

   $(x^2 - 6x + 8)(x - 6)$

   $x^3 - 12x^2 + 44x - 48$
6. $(x + 5)(x)(x - 5)$

   $x(x^2 - 25)$

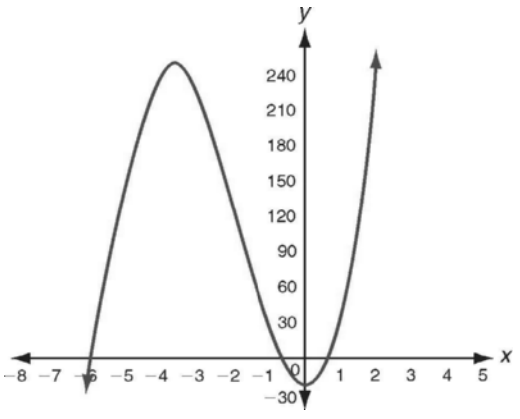
   $x^3 - 25x$
7. 1; 2; 1; 2; $x^2 + 4$; $2i$; $-2i$

Challenge

1. $-5 + 3 = -2$; $(-5)(3) = -15$
2. $-2 + 1 + 4 = -(-3) = 3$; $(-2)(1) + (-2)(4) + (1)(4) = -6$; $(-2)(1)(4) = -8$
3. $z_1z_2z_3 = -84 = (7)(-3)\ (z_3)$; $z_3 = 4$
4. $-2 + 5 + z_3 + z_4 = 1$; $(-2)(5) + (-2)(z_3) + (-2)(z_4) + (5)(z_3) + (5)(z_4) + (z_3)(z_4) = -19$; $z_3 = 1$; $z_4 = -3$
5. $(x - z_1)(x - z_2)(x - z_3) = x^3 - (z_1 + z_2 + z_3)x^2 + (z_1z_2 + z_1z_3 + z_2z_3)x - z_1z_2z_3$

Problem Solving

1. a. $V = 4\pi r^2$

   b. $V = \frac{1}{2}\left(\frac{4}{3}\pi r^3\right)$
2. $\frac{13}{12}\pi = 4\pi r^2 + \frac{2}{3}\pi r^3$
3. $8r^3 + 48r^2 - 13 = 0$
4. 

5. $\frac{1}{2}$
6. $x = \frac{-26 \pm 21.6}{8}$; both these roots are