

## Extra Practice

### Chapter 5

#### Lesson 5-1

Write each polynomial in standard form. Then classify it by degree and by number of terms.

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

2.  $3x - \frac{1}{3} - 5x$

3.  $3n^2 + n^3 - n - 3 - 3n^3$

4.  $15 - y^2 - 10y - 8 + 8y$

5.  $6c^2 - 4c + 7 - 8c^2$

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

Determine the end behavior of the graph of each polynomial function.

7.  $y = x^2 - 2x + 3$

8.  $y = x^3 - 2x$

9.  $y = 7x^5 + 3x^3 - 2x$

10.  $y = \frac{1}{2}x^4 + 5x^2 - \frac{1}{2}$

11.  $y = 15x^9$

12.  $y = -x^{12} + 6x^6 - 36$

#### Lesson 5-2

Write each polynomial in factored form. Check by multiplication.

13.  $x^3 + 5x$

14.  $x^3 + x^2 - 6x$

15.  $6x^3 - 7x^2 - 3x$

Write a polynomial function in standard form with the given zeros.

16.  $x = 3, 2, -1$

17.  $x = 1, 1, 2$

18.  $x = -2, -1, 1$

19.  $x = 1, 2, 6$

20.  $x = -3, -1, 5$

21.  $x = 0, 0, 2, 3$

22.  $x = -2, 1, 2, 2$

23.  $x = 2, 4, 5, 7$

24.  $x = -2, 0, \frac{1}{3}, 1$

Find the zeros of each function. State the multiplicity of multiple zeros.

25.  $y = (x - 2)(x + 4)$

26.  $y = (x - 7)(x - 3)$

27.  $y = (x + 1)(x - 8)(x - 9)$

28.  $y = x(x + 1)(x + 5)$

29.  $y = x^2(x + 1)$

30.  $y = (x - 3)(x - 4)^2$

31. Find the relative maximum and minimum of the graph of  $f(x) = x^3 - 3x^2 + 2$ . Then graph the function.

32. A jewelry store is designing a gift box. The sum of the length, width, and height is 12 inches. If the length is one inch greater the height, what should the dimensions of the box be to maximize its volume? What is the maximized volume?

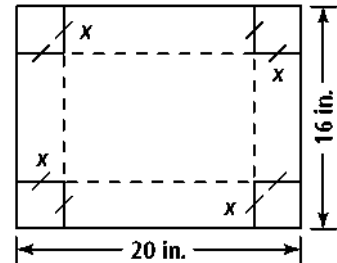
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**Extra Practice** (continued)**Chapter 5**

- 33.** Tonya wants to make a metal tray by cutting four identical square corner pieces from a rectangular metal sheet. Then she will bend the sides up to make an open tray.

- a. Let the length of each side of the removed squares be  $x$  in.  
Express the volume of the box as a polynomial function of  $x$ .
- b. Find the dimensions of a tray that would have a  $384\text{-in.}^3$  capacity.

**Lesson 5-3**

Find the real or imaginary solutions of each equation by factoring.

- 34.**  $x^3 + 27 = 0$                       **35.**  $8x^3 = 125$                       **36.**  $9 = 4x^2 - 16$   
**37.**  $x^2 + 400 = 40x$                       **38.**  $0 = 4x^2 + 28x + 49$                       **39.**  $-9x^4 = -48x^2 + 64$

Solve each equation.

- 40.**  $t^3 - 3t^2 - 10t = 0$                       **41.**  $4m^3 + m^2 - m + 5 = 0$   
**42.**  $t^3 - 6t^2 + 12t - 8 = 0$                       **43.**  $2c^3 - 7c^2 - 4c = 0$   
**44.**  $w^4 - 13w^2 + 36 = 0$                       **45.**  $x^3 + 2x^2 - 13x + 10 = 0$
- 46.** The product of three consecutive integers is 210. Use  $N$  to represent the middle integer.
- a. Write the product as a polynomial function of  $P(N)$ .
- b. Find the three integers.
- 47.** The product of three consecutive odd integers is 6783.
- a. Write an equation to model the situation.
- b. Solve the equation by graphing to find the numbers.

**Lesson 5-4**

Determine whether each binomial is a factor of  $x^3 - 5x^2 - 2x + 24$ .

- 48.**  $x + 2$                       **49.**  $x - 3$                       **50.**  $x + 4$

Divide.

- 51.**  $(x^3 - 3x^2 + 2) \div (x - 1)$                       **52.**  $(x^3 - x^2 - 6x) \div (x - 3)$   
**53.**  $(2x^3 + 10x^2 + 8x) \div (x + 4)$                       **54.**  $(x^4 + x^2 - 6) \div (x^2 + 3)$   
**55.**  $(x^2 - 4x + 2) \div (x - 2)$                       **56.**  $(x^3 + 11x + 12) \div (x + 3)$



**Extra Practice** (continued)**Chapter 5****Lesson 5-5****Find the roots of each polynomial equation.**

57.  $x^3 + 2x^2 + 3x + 6 = 0$

58.  $x^3 - 3x^2 + 4x - 12 = 0$

59.  $3x^4 + 11x^3 + 14x^2 + 7x + 1 = 0$

60.  $3x^4 - x^3 - 22x^2 + 24x = 0$

61.  $45x^3 + 93x^2 - 12 = 0$

62.  $8x^4 - 66x^3 + 175x^2 - 132x - 45 = 0$

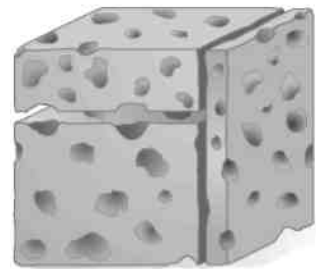
**Lesson 5-6****Find all the zeros of each function.**

63.  $f(x) = x^3 - 4x^2 + x - 6$

64.  $g(x) = 3x^3 - 3x^2 + x - 1$

65.  $h(x) = x^4 - 5x^3 - 8x + 40$

66.  $f(x) = 2x^4 - 12x^3 + 21x^2 + 2x - 33$



67. A block of cheese is a cube whose side is  $x$  in. long. You cut off a 1-inch thick piece from the right side. Then you cut off a 3-inch thick piece from the top, as shown at the right. The volume of the remaining block is  $2002 \text{ in.}^3$ . What are the dimensions of the original block of cheese?

68. You can construct triangles by connecting three vertices of a convex polygon with  $n$  sides. The number of all possible such triangles can be represented as  $f(n) = \frac{n^3 - 3n^2 + 2n}{6}$ .

Find the value of  $n$  such that you can construct 84 such triangles from the polygon.

67.

**Lesson 5-7**

**Use the Binomial Theorem to expand each binomial.**

**69.**  $(x - 1)^3$

**70.**  $(3x + 2)^4$

**71.**  $(4x + 10)^3$

**72.**  $(x + 2y)^7$

**73.**  $(5x - y)^5$

**74.**  $(x - 4y^3)^4$

**75.** The side length of a cube is given by the expression  $(2x + 3y^2)$ . Write a binomial expression for the volume of the cube.

**76.** What is the sixth term in the binomial expansion of  $(3x - 4)^8$ ?

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**Extra Practice** (continued)

## Chapter 5

**Lesson 5-8**

Find a polynomial function whose graph passes through each set of points.

77. (2, 5) and (8, 11)

78. (3, -3) and (7, 9)

79. (-2, 16) and (4, 13)

80. (-1, -7), (1, 1), and (2, -1)

81. (1, 5), (3, 11), and (5, 5)

82. (-4, -13), (-1, 2), (0, -1), and (1, 2)

83. The table shows the annual population of Florida for selected years.

Year	1970	1980	1990	2000
Population (millions)	6.79	9.75	12.94	15.98

- Find a polynomial function that best models the data.
- Use your model to estimate the population of Florida in 2020.
- Use your model to estimate when the population of Florida will reach 20.59 million.

**Lesson 5-9**

Determine the cubic function that is obtained from the parent function  $y = x^3$  after each sequence of transformations.

84. vertical stretch by a factor of 2;  
reflection across the  $x$ -axis;  
horizontal translation 3 units left

85. vertical stretch by a factor of 3;  
vertical translation down 2 units;  
horizontal translation 1 unit right

Find all the real zeros of each function.

86.  $y = 2(x - 3)^3 + 2$

87.  $6(x + 3)^3 - 6$

88.  $-\frac{1}{3}\left(x + \frac{1}{2}\right)^3 - 5$

Find a quartic function with the given  $x$ -values as its only real zeros.

89.  $x = -3$  and  $x = 3$

90.  $x = 1$  and  $x = 3$

91.  $x = 0$  and  $x = 4$

92.  $x = -8$  and  $x = -6$

93.  $x = -2$  and  $x = 8$

94.  $x = -3$  and  $x = 5$

