

**Extra Practice**

## Chapter 6

**Lesson 6-1**

Simplify each radical expression. Use absolute value symbols as needed.

1.  $\sqrt{36x^4}$   **$6x^2$**

2.  $\sqrt{c^{80}d^{50}}$   **$c^{40}|d^{25}|$**

3.  $\sqrt[4]{81x^{12}}$   **$3|x^3|$**

4.  $\sqrt[3]{-64}$  **-4**

5.  $\sqrt[5]{-32k^5}$  **-2k**

6.  $\sqrt[4]{\frac{1}{16}w^{12}}$   **$\frac{1}{2}|w^3|$**

7.  $\sqrt[4]{m^{18}n^8}$   **$m^4n^2\sqrt{m}$**

8.  $\sqrt[3]{27y^{15}}$   **$3y^5$**

9.  $\sqrt[5]{-243r^{20}}$  **-3r<sup>4</sup>**

10. You can use the expression  $D = 1.2\sqrt{h}$  to approximate the visibility range  $D$ , in miles, from a height of  $h$  feet above ground.

a. Estimate the visibility from a height of 900 feet. **36mi**

b. How far above ground is an observer whose visibility range is 84 miles? **4900 ft**

11. You can approximate the speed of a falling object as  $v = 8\sqrt{d}$ , where  $v$  is the speed in feet per second and  $d$  is the distance, in feet, the object has fallen.

Express  $d$  in terms of  $v$ .  **$d = \frac{v^2}{64}$**

**Lesson 6-2**

Multiply or divide and simplify. Assume that all variables are positive.

12.  $\sqrt{3x^4} \cdot \sqrt{24x^3}$   **$6x^3\sqrt{2x}$**

13.  $\sqrt[3]{4} \cdot \sqrt[3]{18}$   **$2\sqrt[3]{9}$**

14.  $\sqrt{5a^3} \cdot \sqrt{20a}$   **$10a^2$**

15.  $\frac{\sqrt{80}}{\sqrt{5}}$  **4**

16.  $\frac{\sqrt{18x^5}y}{\sqrt{2x}}$   **$3x^2\sqrt{y}$**

17.  $\frac{\sqrt[3]{640w^3z^8}}{\sqrt[3]{5wz^4}}$   **$4z\sqrt[3]{2w^2z}$**

18. The time  $T$  it takes a pendulum to make a full swing in each direction and return to its original position is called the period of the pendulum. The equation  $T = 2\pi\sqrt{\frac{\ell}{32}}$  relates the length of the pendulum  $\ell$ , in feet, to its period  $T$ , in seconds. How long is a pendulum if its period is 3 seconds?

Round the answer to the nearest tenth. **7.3 ft**

**Lesson 6-3**

Simplify.

19.  $2\sqrt{7} + 3\sqrt{7}$   **$5\sqrt{7}$**

20.  $\sqrt{32} + \sqrt{8}$   **$6\sqrt{2}$**

21.  $\sqrt{7x} + \sqrt{28x}$   **$3\sqrt{7x}$**

22.  $3\sqrt{18} + 2\sqrt{72}$   **$21\sqrt{2}$**

23.  $\sqrt{27} + \sqrt{48}$   **$7\sqrt{3}$**

24.  $8\sqrt{45} - 3\sqrt{80}$   **$12\sqrt{5}$**

25.  $(2 + \sqrt{5})(3 + \sqrt{5})$   **$11 + 5\sqrt{5}$**

26.  $(6 - \sqrt{7})(1 - \sqrt{7})$   **$13 - 7\sqrt{7}$**

27.  $(\sqrt{10} + 3)^2$   **$19 + 6\sqrt{10}$**

28.  $(3\sqrt{5} - 2)(3\sqrt{5} + 2)$  **41**

29.  $\frac{5}{2 - \sqrt{3}}$

10 + 5\sqrt{3}

30.  $\frac{4 - 3\sqrt{7}}{1 + 2\sqrt{7}}$   **$\frac{5\sqrt{7} - 46}{27}$**

**Extra Practice** (continued)

## Chapter 6

**Lesson 6-4**

Write each expression in simplest form. Assume that all variables are positive.

31.  $81^{\frac{1}{2}}$  **9**

32.  $36^{\frac{1}{4}} \cdot 36^{\frac{1}{4}}$  **6**

33.  $\left(x^{-\frac{4}{3}}y^{\frac{3}{5}}\right)^{15}$   **$\frac{y^9}{x^{20}}$**

34.  $\left(x^{\frac{1}{4}}y^{-\frac{3}{8}}\right)^{16}$   **$\frac{x^4}{y^6}$**

35.  $(8x^{15}y^{-9})^{-\frac{1}{3}}$   **$\frac{y^3}{2x^5}$**

36.  $(-27x^{-9}y^6)^{\frac{1}{3}}$   **$-\frac{3y^2}{x^3}$**

37.  $(-32x^{-10}y^{15})^{\frac{1}{5}}$   **$-\frac{2y^3}{x^2}$**

38.  $(32x^{20}y^{-10})^{-\frac{1}{5}}$   **$\frac{y^2}{2x^4}$**

39.  $\left(\frac{81y^{16}}{16x^{12}}\right)^{\frac{1}{4}}$   **$\frac{3y^4}{2x^3}$**

40.  **$\left(\frac{16x^{14}}{81y^{18}}\right)^{\frac{1}{2}}$**   **$\frac{4x^7}{9y^9}$**

41.  $\sqrt{5} \cdot \sqrt[3]{5}$   **$\sqrt[6]{5^5}$**

42.  **$\frac{\sqrt[6]{x^2}}{\sqrt[3]{x^5}}$**   **$\frac{\sqrt[4]{x}}{x}$**

**Lesson 6-5**

Solve. Check for extraneous solutions.

43.  $\sqrt{13x - 10} = 3x$  **no real solution**

44.  $\sqrt{x + 20} = x$  **5**

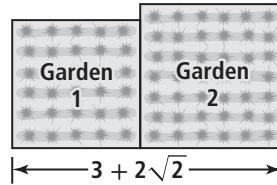
45.  $(4x - 12)^{\frac{1}{2}} + 3 = x$  **3, 7**

46.  $(7x)^{\frac{1}{3}} = (5x + 2)^{\frac{1}{3}}$  **1**

47.  $\sqrt{x - 2} - \sqrt{2x + 3} = -2$  **3, 11**

48.  $\sqrt{10x} - 2\sqrt{5x - 25} = 0$  **10**

49. A community garden offers two different square-shaped plots of growing space as shown. The larger plot measures one square meter greater than the smaller one. The combined lengths of the two gardens is  $3 + 2\sqrt{2}$  meters.

a. What is the area of Garden 1?  **$8 \text{ m}^2$** b. What is the length of Garden 2? **3 m****Lesson 6-6**Let  $f(x) = 3x^2$  and  $g(x) = 2 - 5x$ . Perform each function operation.

50.  $f(x) - g(x)$   **$3x^2 + 5x - 2$**  51.  $f(x) \cdot g(x)$   **$-15x^3 + 6x^2$**  52.  $\frac{f(x)}{g(x)}$   **$\frac{3x^2}{2 - 5x}$**

53.  $(f + g)(x)$   **$3x^2 - 5x + 2$**  54.  $(f \cdot g)(x)$   **$-15x^3 + 6x^2$**  55.  $\frac{g}{f}(x)$   **$\frac{2 - 5x}{3x^2}$**

Let  $f(x) = x^2$  and  $g(x) = 3x + 1$ . Evaluate each expression.

56.  $(f \circ g)(0)$  **1**

57.  $(f \circ g)(2)$  **49**

58.  $(f \circ g)(-3)$  **64**

59.  $(f \circ g)(5)$  **256**

60.  $(g \circ f)(0)$  **1**

61.  $(g \circ f)(1)$  **4**

62.  $(g \circ f)(-1)$  **4**

63.  $(f \circ f)(3)$  **81**

64.  $(g \circ g)(4)$  **40**

**Extra Practice** (continued)

## Chapter 6

- 65.** Halina works in a department store. Three times per year she is allowed to combine her employee discount with special sale prices. Let  $x$  be the retail price of a blouse.
- Halina's employee discount is 20%. Write a function  $E(x)$  that represents the cost of the blouse after the discount.  $E(x) = 0.8x$
  - Due to a manufacturer's incentive, the blouse is marked down 25%. Write a function  $M(x)$  that represents the sale price.  $M(x) = 0.75x$
  - The sales tax on clothing is 6%. Write a function  $T(x)$  that describes the cost of a clothing item with sales tax included.  $T(x) = 1.06x$
  - Halina found a blouse to which the discounts apply. Use the function composition  $f = T \circ E \circ M$  to write the function  $f(x)$  that represents the price Halina will pay for the blouse.  $f(x) = 0.636x$
- 66.** You invest  $p$  dollars in an account that earns a simple interest of 6%. The function that represents the account balance at the end of the year is  $f(p) = 1.06p$ .
- Suppose that at the end of the year you deposit \$500 in the account. Write a new function  $g(p)$  that shows the balance that will earn interest in the second year.  $g(p) = 1.06p + 500$
  - At the end of every year you add \$500 to the account. The interest rate remains 6%. Write a composition of functions  $f$  and  $g$  to find the account balance at the end of the third year, before adding the \$500. Find that balance for an initial investment of \$1000.  $(f \circ g \circ g)(p); \$2282.82$

**Lesson 6-7**

For each function  $f$ , find  $f^{-1}$  and the domain and range of  $f$  and  $f^{-1}$ . Determine whether  $f^{-1}$  is a function.

**67.**  $f(x) = 6x + 1$

$f^{-1}(x) = \frac{x - 1}{6}$ ; domain of  $f$ : all real numbers, range of  $f$ : all real numbers, domain of  $f^{-1}$ : all real numbers, range of  $f^{-1}$ : all real numbers;  $f^{-1}$  is a function.

**70.**  $f(x) = \sqrt{-5x + 2}$

$f^{-1}(x) = \frac{x^2 - 2}{5}$ ,  $x \geq 0$ ; domain of  $f$ :  $\{x \leq \frac{2}{5}\}$ , range of  $f$ :  $\{y \geq 0\}$ , domain of  $f^{-1}$ :  $\{x \geq 0\}$ , range of  $f^{-1}$ :  $\{y \leq \frac{2}{5}\}$ ;  $f^{-1}$  is a function.

**68.**  $f(x) = \sqrt{x + 4}$

$f^{-1}(x) = x^2 - 4$ ,  $x \geq 0$ ; domain of  $f$ :  $\{x \geq -4\}$ , range of  $f$ :  $\{y \geq 0\}$ , domain of  $f^{-1}$ :  $\{x \geq 0\}$ , range of  $f^{-1}$ :  $\{y \geq -4\}$ ;  $f^{-1}$  is a function.

**71.**  $f(x) = 3x^2 + 1$

$f^{-1}(x) = \pm \sqrt{\frac{x - 1}{3}}$ ; domain of  $f$ : all real numbers, range of  $f$ :  $\{y \geq 1\}$ , domain of  $f^{-1}$ :  $\{x \geq 1\}$ , range of  $f^{-1}$ : all real numbers;  $f^{-1}$  is not a function.

**69.**  $f(x) = \sqrt{x - 3}$

$f^{-1}(x) = x^2 + 3$ ,  $x \geq 0$ ; domain of  $f$ :  $\{x \geq 3\}$ , range of  $f$ :  $\{y \geq 0\}$ , domain of  $f^{-1}$ :  $\{x \geq 0\}$ , range of  $f^{-1}$ :  $\{y \geq 3\}$ ;  $f^{-1}$  is a function.

**72.**  $f(x) = 2 - x^2$

$f^{-1}(x) = \pm \sqrt{2 - x}$ ; domain of  $f$ : all real numbers, range of  $f$ :  $\{y \leq 2\}$ , domain of  $f^{-1}$ :  $\{x \leq 2\}$ , range of  $f^{-1}$ : all real numbers;  $f^{-1}$  is not a function.

**Extra Practice** (continued)

## Chapter 6

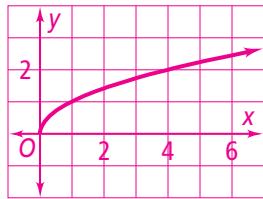
- 73.** You can use the function  $f(x) = 331.4 + 0.6x$  to approximate the speed of sound in dry air, where  $x$  is the temperature in degrees Celsius.

- a. Write an algebraic expression for the inverse function  $f^{-1}(x)$ .  $f^{-1}(x) = \frac{x - 331.4}{0.6}$
- b. Evaluate  $f^{-1}(x)$  for  $x = 350$ . Round the result to the nearest whole number.  
Explain what your result represents. **31°C; The speed of sound is 350 m/s at 31°C.**

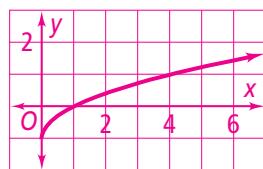
**Lesson 6-8**

Graph each function.

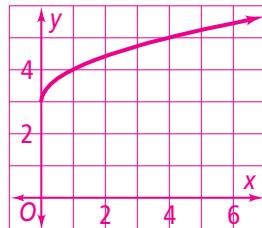
**74.**  $y = \sqrt{x}$



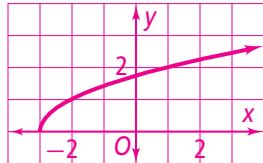
**75.**  $y = \sqrt{x} - 1$



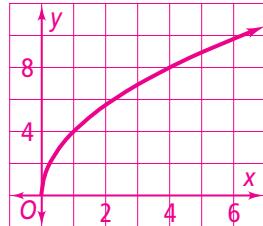
**76.**  $y = \sqrt{x} + 3$



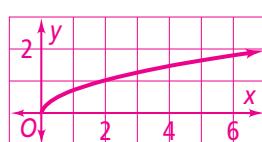
**77.**  $y = \sqrt{x+3}$



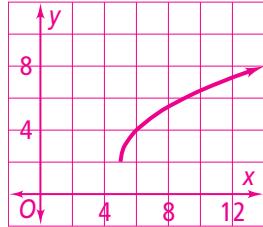
**78.**  $y = 4\sqrt{x}$



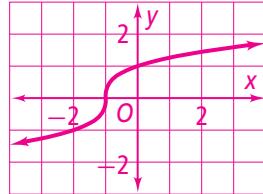
**79.**  $y = \frac{3}{4}\sqrt{x}$



**80.**  $y = 2\sqrt{x-5} + 2$



**81.**  $y = \sqrt[3]{x+1}$



**82.**  $y = \sqrt[3]{x-2} - 3$

