5 Chapter Review WITH CalcChat®

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Chapter Learning Target Understand rational exponents and radical functions.

Chapter Success Criteria

- ◆ I can represent roots using rational exponents.
- ◆ I can describe the properties of rational exponents and radicals.
- ■ I can solve radical equations and inequalities.
- ■ I can find compositions and inverses of functions.

◆ Surface ■ Deep

SELF-ASSESSMENT 1 I do not understand. 2 I can do it with help. 3 I can do it on my own. 4 I can teach someone else.

5.1 *n*th Roots and Rational Exponents (pp. 231–236) WATCH

Learning Target: Evaluate expressions and solve equations containing *n*th roots and rational exponents.

Vocabulary AZ VOCAB
*n*th root of *a*
index of a radical

Find the indicated *n*th root(s) of *a*.

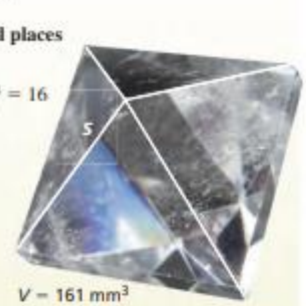
1. $n = 4, a = 1296$
2. $n = 5, a = -1024$

Evaluate the expression without using technology.

3. $8^{7/3}$
4. $9^{5/2}$
5. $(-27)^{-2/3}$

Find the real solution(s) of the equation. Round your answer to two decimal places when appropriate.

6. $x^5 + 17 = 35$
7. $7x^3 = 189$
8. $(x + 8)^4 = 16$
9. Without using technology, show that $3^{1.45}$ must be less than 6.
10. A diamond has eight equilateral triangles as faces. The formula $V = 0.47s^3$ approximates the volume V (in cubic millimeters) of the diamond, where s is the side length (in millimeters) of each edge. Approximate the length of each edge of the diamond.



5.2 Properties of Rational Exponents and Radicals (pp. 237–244) WATCH

Learning Target: Simplify radical expressions.

Vocabulary AZ VOCAB
simplest form of a radical
like radicals

Simplify the expression.

11. $\left(\frac{6^{2/5}}{6^{1/5}}\right)^3$
12. $\sqrt[4]{32} \cdot \sqrt[4]{8}$
13. $\frac{1}{2 - \sqrt{7}}$
14. $4\sqrt[5]{8} + 3\sqrt[5]{8}$
15. $2\sqrt{48} - \sqrt{3}$
16. $(5^{2/3} \cdot 2^{3/2})^{1/2}$

Simplify the expression. Assume all variables are positive.

17. $\sqrt[3]{125z^9}$
18. $\frac{2^{1/4}z^{5/4}}{6z}$
19. $\sqrt{10z^5} - z^2\sqrt{40z}$

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5.3 Graphing Radical Functions (pp. 245–252)

Learning Target: Describe and graph transformations of radical functions.

Vocabulary
radical function

Describe the transformation of f represented by g. Then graph each function.

20. $f(x) = \sqrt{x},\ g(x) = -2\sqrt{x}$

21. $f(x) = \sqrt[3]{x},\ g(x) = \sqrt[3]{-x} - 6$

22. Let the graph of g be a reflection in the y-axis, followed by a translation 7 units right of the graph of $f(x) = \sqrt[3]{x}$. Write a rule for g.

23. Use technology to graph $2y^2 = x - 8$. Identify the vertex and the direction the parabola opens.

24. Use technology to graph $x^2 + y^2 = 81$. Identify the radius and the intercepts.

25. An investigator uses the model $s = 4\sqrt{d}$ to estimate the speed s (in miles per hour) of a car just prior to an accident, where d is the length (in feet) of the skid marks. Graph the model. The skid marks are 90 feet long. Was the car traveling at the posted speed limit prior to the accident? Explain your reasoning.

5.4 Solving Radical Equations and Inequalities (pp. 253–260)

Learning Target: Solve equations and inequalities containing radicals and rational exponents.

Vocabulary
radical equation
extraneous solution

Solve the equation. Check your solution.

26. $4\sqrt[3]{2x + 1} = 20$

27. $\sqrt{4x - 4} = \sqrt{5x - 1} - 1$

28. $(6x)^{2/3} = 36$

Solve the inequality.

29. $5\sqrt{x} + 2 > 17$

30. $2\sqrt{x - 8} < 24$

31. $7\sqrt[3]{x - 3} \geq 21$

32. In a tsunami, the wave speeds (in meters per second) can be modeled by $s(d) = \sqrt{9.8d}$, where d is the depth (in meters) of the water. Estimate the depth of the water when the wave speed is 200 meters per second.

5.5 Performing Function Operations (pp. 261–266)

Learning Target: Perform arithmetic operations on two functions.

33. Let $f(x) = 2\sqrt{3 - x}$ and $g(x) = 4\sqrt[3]{3 - x}$. Find $(fg)(x)$ and $\left(\frac{f}{g}\right)(x)$ and state the domain of each. Then evaluate $(fg)(2)$ and $\left(\frac{f}{g}\right)(2)$.

34. Let $f(x) = 3x^2 + 1$ and $g(x) = x + 4$. Find $(f + g)(x)$ and $(f - g)(x)$ and state the domain of each. Then evaluate $(f + g)(-5)$ and $(f - g)(-5)$.

Determine whether the statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

35. For two quadratic functions f and g, $f + g$ is also a quadratic function.

36. For two functions f and g, when $f(a) = 3$ and $g(a) = 4$, $(fg)(a) = 12$.

5.6 Composition of Functions (pp. 267–272)

WATCH

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Learning Target: Evaluate and find compositions of functions.

Vocabulary VOCAB
composition

Let $f(x) = x + 3$, $g(x) = 4x^2$, and $h(x) = \sqrt{x - 7}$. Find the indicated value.

37. $f(h(11))$ **38.** $g(f(-8))$ **39.** $h(g(2))$

Let $f(x) = 2x - 5$, $g(x) = x^{-2}$, and $h(x) = 3x + 4$. Perform the indicated composition and state the domain.

40. $f(g(x))$ **41.** $h(f(x))$ **42.** $g(h(x))$

43. Let f be a radical function and let g be a linear function with a nonzero slope. What type of function results when you compose f and g?

44. You have the coupons shown to use for a purchase at an online store. Use a composition of functions to determine which coupon you should apply first. Explain.

5.7 Inverse of a Function (pp. 273–282)

WATCH

Learning Target: Understand the relationship between inverse functions.

Vocabulary VOCAB
inverse functions

Find the inverse of the function. Then graph the function and its inverse.

45. $f(x) = -\frac{1}{2}x + 10$ **46.** $f(x) = x^2 + 8, x \geq 0$

47. $f(x) = -x^3 - 9$ **48.** $f(x) = 3\sqrt{x} + 5$

Determine whether the functions are inverse functions.

49. $f(x) = 4(x - 11)^2, g(x) = \frac{1}{4}(x + 11)^2$ **50.** $f(x) = -2x + 6, g(x) = -\frac{1}{2}x + 3$

51. On a certain day, the function that gives U.S. dollars in terms of British pounds is $d(p) = 0.777p$, where p represents British pounds. Find and interpret $d^{-1}(100)$.

Mathematical Practices

Model with Mathematics

Mathematically proficient students identify important quantities in practical situations and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas.

1. Explain how the equation you used to solve Exercise 45 on page 236 demonstrates the relationship among the given information.

2. In Example 3 on page 248, the relationship between time (in seconds) and the distance (in feet) that an object falls on Mars is represented by a function. Represent this relationship in two other ways.