Extra Example 6.1

Evaluate the expression.

a. $(\sqrt[5]{-32})^2$ **4**

b. $64^{5/3}$ **1024**

6 CHAPTER REVIEW

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• Multi-Language Glossary
• Vocabulary practice

REVIEW KEY VOCABULARY

- *n*th root of *a*, *p. 414*
- index of a radical, *p. 414*
- simplest form of a radical, *p. 422*
- like radicals, *p. 422*
- power function, *p. 428*
- composition, *p. 430*
- inverse relation, *p. 438*
- inverse function, *p. 438*
- radical function, *p. 446*
- radical equation, *p. 452*

VOCABULARY EXERCISES

1. Copy and complete: The index of the radical $\sqrt[4]{7}$ is _?_. **4**
2. List two different pairs of like radicals. ***Sample answer:*** $2\sqrt[3]{x}$ **and** $-3\sqrt[3]{x}$, $\sqrt{xy+1}$ **and** $3\sqrt{xy+1}$
3. Copy and complete: A(n) _?_ function has the form $y = ax^b$ where a is a real number and b is a rational number. **power**
4. **WRITING** *Explain* how the graph of a function and the graph of its inverse are related. **They are reflections of each other in the line $y = x$.**
5. **WRITING** *Explain* how to use the horizontal line test to determine whether the inverse of a function f is also a function. **If a horizontal line crosses the graph of the function more than once, the inverse is not a function.**
6. **WRITING** *Describe* how the graph of $y = \sqrt[3]{x-4} + 5$ is related to the graph of the parent function $y = \sqrt[3]{x}$. **It is translated 4 units right and 5 units up.**
7. **REASONING** A student began solving the equation $x^{2/3} = 5$ by cubing each side. What will the student have to do next? What could the student have done to solve the equation in just one step? **Take the square root of each side; raise each side to the $\frac{3}{2}$ power.**

REVIEW EXAMPLES AND EXERCISES

Use the review examples and exercises below to check your understanding of the concepts you have learned in each lesson of Chapter 6.

6.1 Evaluate *n*th Roots and Use Rational Exponents *pp. 414–419*

EXAMPLE

Evaluate the expression.

a. $(\sqrt[4]{16})^5 = 2^5 = 32$

b. $27^{-4/3} = \frac{1}{27^{4/3}} = \frac{1}{(27^{1/3})^4} = \frac{1}{3^4} = \frac{1}{81}$

EXERCISES

EXAMPLE 2 on p. 415 for Exs. 8–15

Evaluate the expression without using a calculator.

8. $81^{1/4}$ **3**
9. $0^{1/3}$ **0**
10. $\sqrt[3]{-64}$ **−4**
11. $\sqrt[3]{125}$ **5**
12. $256^{3/4}$ **64**
13. $27^{-2/3}$ $\frac{1}{9}$
14. $(\sqrt[3]{8})^7$ **128**
15. $\frac{1}{(\sqrt[5]{-32})^{-3}}$ **−8**

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6.2 Apply Properties of Rational Exponents

pp. 420–427

EXAMPLE

Write the expression in simplest form. Assume all variables are positive.

a. $\sqrt[3]{48} = \sqrt[3]{8 \cdot 6} = \sqrt[3]{8} \cdot \sqrt[3]{6} = 2\sqrt[3]{6}$

b. $\left(\frac{x^4}{y^8}\right)^{1/2} = \frac{(x^4)^{1/2}}{(y^8)^{1/2}} = \frac{x^{4 \cdot 1/2}}{y^{8 \cdot 1/2}} = \frac{x^2}{y^4}$

EXAMPLES 4, 6, and 7 on pp. 422–423 for Exs. 16–19

EXERCISES

Write the expression in simplest form. Assume all variables are positive.

16. $\sqrt[3]{80}$ $2\sqrt[3]{10}$ **17.** $(3^4 \cdot 5^4)^{-1/4}$ $\frac{1}{15}$ **18.** $(25a^{10}b^{16})^{1/2}$ $5a^5b^8$ **19.** $\sqrt{\frac{18x^5y^4}{49xz^3}}$ $\frac{3x^2y^2\sqrt{2z}}{7z^2}$

6.3 Perform Function Operations and Composition

pp. 428–434

EXAMPLE

Let $f(x) = 3x^2 + 1$ and $g(x) = x + 4$. Perform the indicated operation.

a. $f(x) + g(x) = (3x^2 + 1) + (x + 4) = 3x^2 + x + 5$

b. $f(x) \cdot g(x) = (3x^2 + 1)(x + 4) = 3x^3 + 12x^2 + x + 4$

c. $f(g(x)) = f(x + 4) = 3(x + 4)^2 + 1 = 3(x^2 + 8x + 16) + 1 = 3x^2 + 24x + 49$

EXAMPLES 1, 2, and 5 on pp. 428–430 for Exs. 20–23

EXERCISES

Let $f(x) = 4x - 6$ and $g(x) = x + 8$. Perform the indicated operation.

20. $f(x) + g(x)$ $5x + 2$ **21.** $f(x) - g(x)$ $3x - 14$ **22.** $f(x) \cdot g(x)$ $4x^2 + 26x - 48$ **23.** $f(g(x))$ $4x + 26$

6.4 Use Inverse Functions

pp. 438–445

EXAMPLE

Find the inverse of the function $y = 3x + 7$.

$y = 3x + 7$ Write original function.

$x = 3y + 7$ Switch x and y.

$x - 7 = 3y$ Subtract 7 from each side.

$\frac{1}{3}x - \frac{7}{3} = y$ Divide each side by 3.

EXAMPLES 1, 4, and 5 on pp. 438–441 for Exs. 24–26

EXERCISES

Find the inverse of the function.

24. $y = \frac{1}{3}x + 4$ $y = \frac{x-4}{2}$ **25.** $y = 4x^2 + 9, x \ge 0$ $y = \frac{\sqrt{x-9}}{2}$ **26.** $f(x) = x^3 - 4$ $f^{-1}(x) = \sqrt[3]{x+4}$

Extra Example 6.2

Write the expression in simplest form. Assume all variables are positive.

a. $\sqrt[3]{250}$ $5\sqrt[3]{2}$

b. $\sqrt[5]{\frac{c}{d^8}}$ $\frac{\sqrt[5]{cd^2}}{d^2}$

Extra Example 6.3

Let $f(x) = x^2 - 1$ and $g(x) = 2x + 5$. Perform the indicated operation.

a. $f(x) - g(x)$ $x^2 - 2x - 6$

b. $f(x) \cdot g(x)$ $2x^3 + 5x^2 - 2x - 5$

c. $g(f(x))$ $2x^2 + 3$

Extra Example 6.4

Find the inverse of the function $f(x) = 2x^3 + 5$. $f^{-1}(x) = \sqrt[3]{\frac{x-5}{2}}$

6 CHAPTER REVIEW

6.5 Graph Square Root and Cube Root Functions

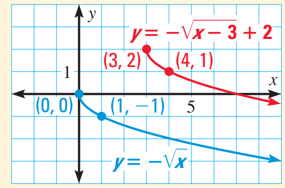
pp. 446–451

EXAMPLE

Graph $y = -\sqrt{x-3} + 2$.

Sketch the graph of $y = -\sqrt{x}$. Notice that it begins at the origin and passes through the point $(1, -1)$.

For $y = -\sqrt{x-3} + 2$, $h = 3$, and $k = 2$. So, shift the graph of $y = -\sqrt{x}$ right 3 units and up 2 units. The resulting graph begins at the point $(3, 2)$ and passes through the point $(4, 1)$.

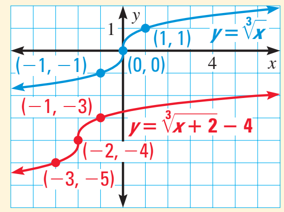


EXAMPLE

Graph $y = \sqrt[3]{x+2} - 4$.

Sketch the graph of $y = \sqrt[3]{x}$. Notice that it passes through the points $(-1, -1)$, $(0, 0)$, and $(1, 1)$.

For $y = \sqrt[3]{x+2} - 4$, $h = -2$ and $k = -4$. So, shift the graph of $y = \sqrt[3]{x}$ left 2 units and down 4 units. The resulting graph passes through the points $(-3, -5)$, $(-2, -4)$, and $(-1, -3)$.



EXAMPLES 4 and 5 on p. 448 for Exs. 27–29

EXERCISES

Graph the function. Then state the domain and range. **27–29. See margin for art.**

27. $y = \sqrt{x+3} + 5$ **domain: $x \ge -3$, range: $y \ge 5$**

28. $y = 3\sqrt{x+1} - 4$ **domain: $x \ge -1$, range: $y \ge -4$**

29. $y = \sqrt[3]{x-4} - 5$ **domain: all real numbers, range: all real numbers**

6.6 Solve Radical Equations

pp. 452–459

EXAMPLE

Solve $\sqrt{4x+9} = 5$.

$\sqrt{4x+9} = 5$	**Write original equation.**
$(\sqrt{4x+9})^2 = 5^2$	**Square each side to eliminate the radical.**
$4x + 9 = 25$	**Simplify.**
$4x = 16$	**Subtract 9 from each side.**
$x = 4$	**Divide each side by 4.**

CHECK Check $x = 4$ in the original equation.

$\sqrt{4x+9} = \sqrt{4(4)+9} = \sqrt{25} = 5$ ✓

EXAMPLES 1, 3, and 5 on pp. 452–454 for Exs. 30–32

EXERCISES

Solve the equation. Check for extraneous solutions.

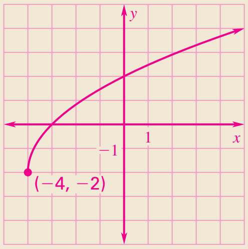
30. $\sqrt[3]{5x-4} = 2$ **$2\frac{2}{5}$**

31. $3x^{3/4} = 24$ **16**

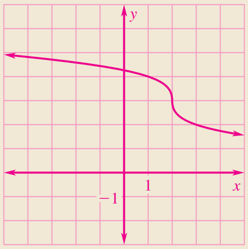
32. $\sqrt{x^2 - 10} = \sqrt{3x}$ **−2, 5**

Extra Examples 6.5

1. Graph $y = 2\sqrt{x+4} - 2$.



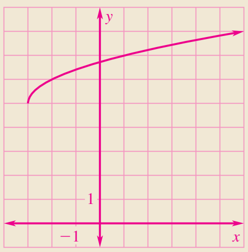
2. Graph $y = -\sqrt[3]{x-2} + 3$.



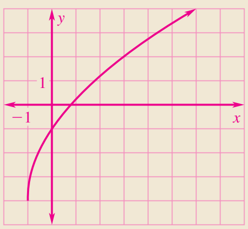
Extra Example 6.6

Solve $\sqrt[3]{5x-14} = -4$. **−10**

27.



28.



29.