apter 6

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

1. $n = 4, a = 81$ ± 3
2. $n = 3, a = 512$
3. $n = 5, a = -243$ -3

Evaluate the expression without using a calculator.

4. $36^{-1/2}$
5. $64^{5/6}$ 32
6. $(\sqrt[3]{216})^{-2}$
7. $(\sqrt[5]{-32})^4$ 16

Solve the equation. Round the result to two decimal places when appropriate.

8. $x^3 = -8$
9. $x^4 + 9 = 90$ ± 3
10. $(x - 3)^5 = 60$ 5.27
11. $-4x^6 = -400$ ± 2.15

Simplify the expression.

12. $4^{5/2} \cdot 4^{-1/2}$
13. $\dfrac{17^{3/7}}{17^{4/7}}$ $\dfrac{1}{17^{1/7}}$
14. $(\sqrt[4]{5} \cdot \sqrt{5})^4$
15. $\dfrac{\sqrt[3]{135}}{\sqrt[3]{5}}$ 3
16. $5\sqrt[5]{7} - 7\sqrt[5]{7}$ $-2\sqrt[5]{7}$
17. $\sqrt[3]{2} + 2\sqrt[3]{128}$ $9\sqrt[3]{2}$
18. $\dfrac{324^{1/4}}{4^{-1/4}}$
19. $4\sqrt[3]{108} \cdot 2\sqrt[3]{4}$ $48\sqrt[3]{2}$

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

20. $\sqrt{20x^6y^7}$ $2x^3y^3\sqrt{5y}$
21. $\sqrt[5]{18x^3y^{14}z^{20}}$ $y^2z^4\sqrt[5]{18x^3y^4}$
22. $\sqrt[4]{\dfrac{x^5}{y^{16}}}$ $\dfrac{x}{y^4}\sqrt[4]{x}$
23. $\sqrt[3]{16x^7y^2} \cdot \sqrt[3]{6xy^5}$ $2x^2y^2\sqrt[3]{12x^2y}$

Let $f(x) = -x + 4$, $g(x) = x^3$, and $h(x) = \dfrac{x}{4}$. Perform the indicated operation and state the domain. 24–31. See margin.

24. $f(x) + g(x)$
25. $g(x) - f(x)$
26. $g(x) \cdot h(x)$
27. $\dfrac{f(x)}{g(x)}$
28. $f(g(x))$
29. $g(h(x))$
30. $h(f(x))$
31. $f(f(x))$

Verify that *f* and *g* are inverse functions. 32–33. See margin.

32. $f(x) = 2x - 4, g(x) = \dfrac{1}{2}x + 2$
33. $f(x) = 3x^2 + 1, x \geq 0; g(x) = \left(\dfrac{x - 1}{3}\right)^{1/2}$

Find the inverse of the function.

34. $f(x) = 5x - 3$ $f^{-1}(x) = \dfrac{x + 3}{5}$
35. $f(x) = \dfrac{4}{3}x + 2$ $f^{-1}(x) = \dfrac{3}{4}x - \dfrac{3}{2}$
36. $f(x) = \dfrac{1}{2}x^2, x \geq 0$ $f^{-1}(x) = \sqrt{2x}$
37. $f(x) = -x^6 + 2, x \leq 0$
38. $f(x) = \dfrac{4x^4 - 1}{18}, x \geq 0$ $f^{-1}(x) = \sqrt[4]{\dfrac{18x + 1}{4}}$
39. $f(x) = 32x^5 + 4$

Graph the function. Then state the domain and range. 40–47. See margin for art.

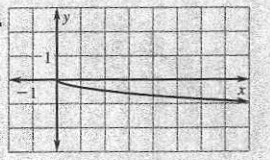
40. $y = -\dfrac{1}{3}\sqrt{x}$ domain: $x \geq 0$, range: $y \leq 0$
41. $y = \dfrac{2}{5}\sqrt[3]{x}$ See margin.
42. $y = \dfrac{5}{6}\sqrt{x}$ domain: $x \geq 0$, range: $y \geq 0$
43. $y = \sqrt{x + 2} - 3$ domain: $x \geq -2$, range: $y \geq -3$
44. $y = -2\sqrt[3]{x - 1} + 2$ See margin.
45. $f(x) = 3\sqrt[3]{x}$ See margin.
46. $g(x) = -\dfrac{1}{2}\sqrt{x - 2}$ domain: $x \geq 2$, range: $y \leq 0$
47. $h(x) = -\sqrt{x + 3} + 4$ domain: $x \geq -3$, range: $y \leq 4$

Solve the equation. Check your solution.

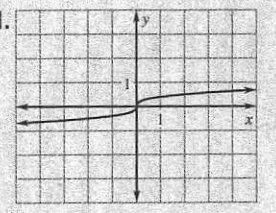
48. $\sqrt{2x + 3} = 7$
49. $-5\sqrt{x + 1} + 12 = 2$ 3
50. $\sqrt[3]{5x - 1} + 6 = 10$
51. $2\sqrt[3]{8x} + 9 = 5$ -1
52. $7x^{4/3} = 175$ $\pm 5\sqrt{5}$
53. $(x - 2)^{3/4} = 1$
54. $x - 8 = \sqrt{18x}$
55. $x = \sqrt{4x - 3}$ $1, 3$
56. $\sqrt{2x + 1} + 5 = \sqrt{x + 12} - 8$ no solution

EXTRA PRACTICE

40.

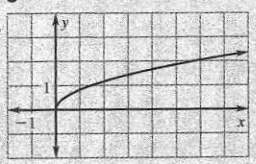


41.



domain: all real numbers, range: all real numbers

42.



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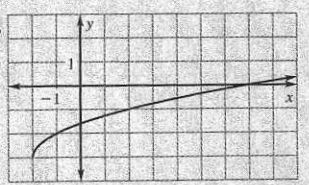

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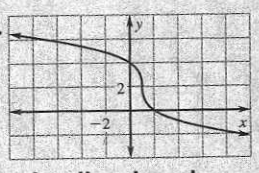

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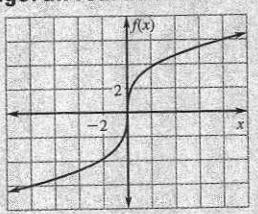

domain: all real numbers, range: all real numbers

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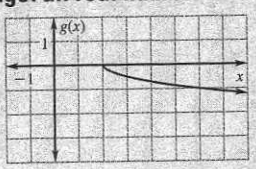

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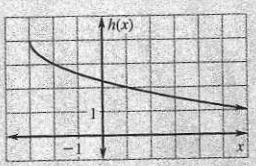

. $x^3 - x + 4$, all real numbers

. $\dfrac{x^4}{4}$, all real numbers

27. except $x = 0$

28. $-x^3 + 4$, all real numbers

29.

30. $-\dfrac{x}{4} + 1$, all real numbers

31.

32, 33. See Additional Answers beginning on p. AA1.