

**EXERCISES 11.2**

In Exercises 1–4, solve the resulting problems if the given changes are made in the indicated examples of this section.

1. In Example 2, change the exponent to  $4/3$ .
2. In Example 4(b), change the exponent to  $-3/2$ .
3. In Example 6, change the exponent to  $-1/3$ .
4. In Example 7(d), change the exponent  $-1/2$  to  $-3/2$ .

In Exercises 5–28, evaluate the given expressions.

- |   |   |                                      |                                       |
|---|---|--------------------------------------|---------------------------------------|
| 5. $25^{1/2}$   | 6. $27^{1/3}$   | 7. $81^{1/4}$                        | 8. $125^{2/3}$                        |
| 9. $100^{25/2}$                                       | 10. $-16^{5/4}$   | 11. $8^{-1/3}$                       | 12. $16^{-1/4}$                       |
| 13. $64^{-2/3}$                                       | 14. $-32^{-4/5}$  | 15. $5^{1/2}5^{3/2}$                 | 16. $(4^4)^{3/2}$                     |
| 17. $(3^6)^{2/3}$                                     | 18. $\frac{121^{-1/2}}{100^{1/2}}$                        | 19. $\frac{1000^{1/3}}{-400^{-1/2}}$ | 20. $\frac{-7^{-1/2}}{6^{-1}7^{1/2}}$ |
| 21. $\frac{15^{2/3}}{5^2 15^{-1/3}}$                  | 22. $\frac{(-27)^{1/3}}{6}$                               | 23. $\frac{(-8)^{2/3}}{-2}$          | 24. $\frac{-4^{-1/2}}{(-64)^{-2/3}}$  |
| 25. $125^{-2/3} - 100^{-3/2}$                         | 26. $32^{0.4} + 25^{-0.5}$                                |                                      |                                       |
| 27. $\frac{16^{-0.25}}{5} + \frac{2^{-0.6}}{2^{0.4}}$ | 28. $\frac{4^{-1}}{36^{-1/2}} - \frac{5^{-1/2}}{5^{1/2}}$ |                                      |                                       |

In Exercises 29–32, use a calculator to evaluate each expression.

- |                     |                       |
|---------------------|-----------------------|
| 29. $17.98^{1/4}$   | 30. $(-750.81)^{2/3}$ |
| 31. $4.0187^{-4/9}$ | 32. $0.1863^{-1/6}$   |

In Exercises 33–56, simplify the given expressions. Express all answers with positive exponents.

- |   |  |   |
|---|--|---|
| 33. $B^{2/3}B^{1/2}$  | 34. $x^{5/6}x^{-1/3}$  | 35. $\frac{y^{-1/2}}{-y^{2/5}}$                               |
| 36. $\frac{s^{1/4}s^{2/3}}{s^{-1}}$                                   | 37. $\frac{x^{3/10}}{x^{-1/5}x^2}$   | 38. $\frac{R^{-2/5}R^2}{R^{-3/10}}$                           |
| 39. $(8a^3b^6)^{1/3}$   | 40. $(8b^{-4}c^2)^{2/3}$   | 41. $(16a^4b^3)^{-3/4}$                                       |
| 42. $(32C^5D^4)^{-2/5}$   | 43. $\left(\frac{a^{5/7}}{a^{2/3}}\right)^{7/4}$                             | 44. $\left(\frac{4a^{5/6}b^{-1/5}}{a^{2/3}b^2}\right)^{-1/2}$ |
| 45. $\frac{1}{2}(4x^2 + 1)^{-1/2}(8x)$                                | 46. $\frac{(x + x^{1/2})(x - x^{1/2})}{x}$                                   |   |
| 47. $\frac{y^{3/8}(y^{5/8} - y^{13/8})}{y^{1/2}(y^{1/2} - y^{-1/2})}$ | 48. $\frac{3^{-1}a^{1/2}}{4^{-1/2}b} \div \frac{9^{1/2}a^{-1/3}}{2b^{-1/4}}$ |   |
| 49. $(T^{-1} + 2T^{-2})^{-1/2}$                                       | 50. $(a^{-2} - a^{-4})^{-1/4}$   |   |
| 51. $(a^3)^{-4/3} + a^{-2}$   | 52. $(4N^6)^{-1/2} - 2N^{-1}$  |   |
| 53. $[(a^{1/2} - a^{-1/2})^2 + 4]^{1/2}$                              | 54. $4x^{1/2} + \frac{1}{2}x^{-1/2}(4x + 1)$                                 |   |
| 55. $x^2(2x - 1)^{-1/2} + 2x(2x - 1)^{1/2}$                           |  |   |
| 56. $(3n - 1)^{-2/3}(1 - n) - (3n - 1)^{1/3}$                         |  |   |

In Exercises 57–60, graph the given functions.

- |                       |                       |
|-----------------------|-----------------------|
| 57. $f(x) = 3x^{1/2}$ | 58. $f(x) = 2x^{2/3}$ |
| 59. $f(t) = t^{-4/5}$ | 60. $f(V) = 4V^{3/2}$ |

In Exercises 61–68, perform the indicated operations.

61. Simplify  $(x^{n-1} \div x^{n-3})^{1/3}$  and express the result as a radical.
62. (a) Simplify  $(x^2 - 4x + 4)^{1/2}$ . (b) For what values of  $x$  is answer in part (a) valid? Explain.
63. A factor used in determining the performance of a solar-storage system is  $(A/S)^{-1/4}$ , where  $A$  is the actual storage capacity and  $S$  is a standard storage capacity. If this factor explain how to find the ratio  $A/S$ .
64. A factor used in measuring the loudness sensed by the human ear is  $(I/I_0)^{0.3}$ , where  $I$  is the intensity of the sound and  $I_0$  is the reference intensity. Evaluate this factor for  $I = 3.2 \times 10^{-6}$  W/m<sup>2</sup> (ordinary conversation) and  $I_0 = 10^{-12}$  W/m<sup>2</sup>.
65. The period  $T$  of a satellite circling earth is given by  $T^2 = kR^3\left(1 + \frac{d}{R}\right)^3$ , where  $R$  is the radius of earth,  $d$  is the distance of the satellite above earth, and  $k$  is a constant. Solve for  $d$  in terms of  $T$ ,  $R$ , using fractional exponents in the result.
66. The withdrawal resistance  $R$  of a nail of diameter  $d$  in wood is proportional to the holding power. One formula for  $R$  is  $R = ks^{5/2}dh$ , where  $k$  is a constant,  $s$  is the specific gravity of the wood, and  $h$  is the length of the nail in the wood. Solve for  $s$  using fractional exponents in the result.
67. The electric current  $i$  (in A) in a circuit with a battery of voltage  $E$ , a resistance  $R$ , and an inductance  $L$ , is  $i = \frac{E}{R}(1 - e^{-tR/L})$ , where  $t$  is the time after the circuit is closed. See Fig. 11.3. Evaluate  $i$  for  $E = 6.20$  V,  $R = 1.20$   $\Omega$ ,  $L = 3.24$  H, and  $t = 0.001$  s. (The number  $e$  is irrational and can be found from the calculator.)

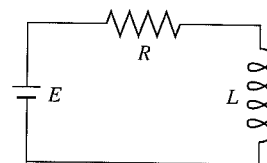


Fig. 11.3

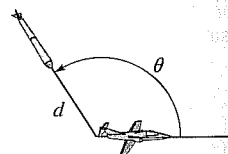


Fig. 11.4

68. For a heat-seeking rocket in pursuit of an aircraft, the distance  $d$  (in km) from the rocket to the aircraft is  $d = \frac{500(\sin \theta)}{1 - \cos \theta}$ , where  $\theta$  is shown in Fig. 11.4. Find  $d$  for  $\theta = 125.0^\circ$ .

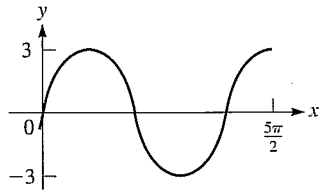
**Answers to Practice Exercises**

- |        |                   |                   |                           |
|--------|-------------------|-------------------|---------------------------|
| 1. 243 | 2. $\frac{1}{81}$ | 3. $16a^{4/3}c^2$ | 4. $\frac{4 - x^3}{2x^4}$ |
|--------|-------------------|-------------------|---------------------------|

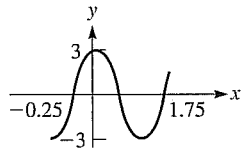
**B.22 ANSWERS TO ODD-NUMBERED EXERCISES**

53.  $4\pi$

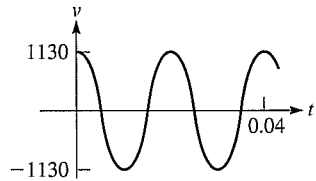
55.  $y = 3 \sin x$



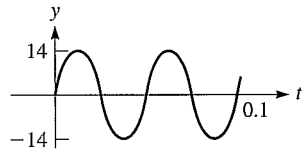
59.  $y = 3 \sin(\pi x + 0.25\pi)$



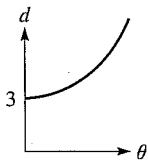
63.



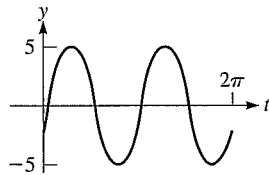
67.



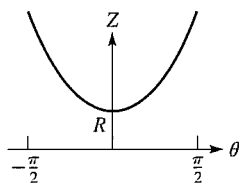
71.



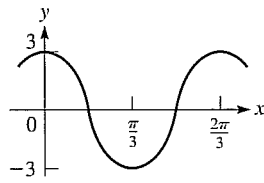
75.



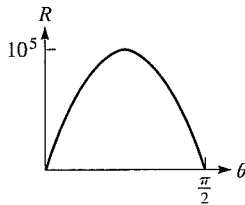
79.



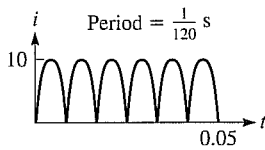
57.  $y = 3 \cos 3x$



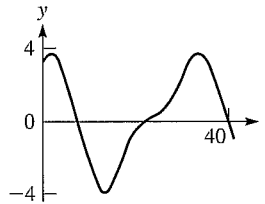
61.



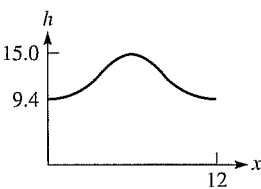
65.



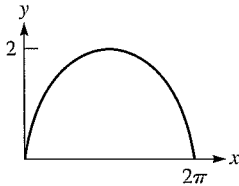
69.



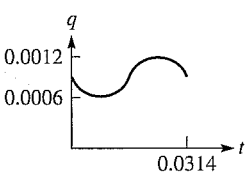
73.



77.



81.



**Exercises 11.1, page 316**

1.  $\frac{y^2}{4x^2}$     3.  $\frac{3}{416}$     5.  $x^3$     7.  $\frac{2}{a^4}$     9.  $\frac{1}{125}$     11.  $\frac{4\pi^2}{x^2}$

13.  $\frac{2n^2}{5a}$     15. 1    17. -7    19.  $\frac{3}{x^2}$     21.  $\frac{a^3}{343x^3}$

23.  $\frac{n^9}{8}$     25.  $\frac{3}{a^3b^6}$     27.  $\frac{1}{a+b}$     29.  $\frac{2x^2+3y^2}{x^2y^2}$

31.  $\frac{8}{3a^n}$     33.  $\frac{b^3}{432a}$     35.  $\frac{4}{t^4v^4}$     37.  $\frac{2a^6+16}{a^8}$     39.  $\frac{10}{9}$

41.  $\frac{R_1R_2}{R_1+R_2}$     43.  $\frac{4n^2-4n+1}{n^4}$     45.  $\frac{8}{99}$     47.  $\frac{x+y}{xy}$

49.  $\frac{t^2+t+2}{t^2}$     51.  $\frac{2D}{D^2-1}$     53. No

55. (a)  $4^5$  (b)  $2^{10}$

57. (a)  $\left(\frac{a}{b}\right)^{-n} = \frac{1}{\left(\frac{a}{b}\right)^n} = \frac{1}{\frac{a^n}{b^n}} = \frac{b^n}{a^n} = \left(\frac{b}{a}\right)^n$

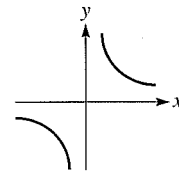
(b)  $303.55182 = 303.55182$

59.  $n = 3$     61. 7    63. N·m    65. J/s<sup>3</sup>    67. 1

69.  $\frac{p[(1+i)^n - 1]}{i(1+i)^n}$

**Exercises 11.2, page 320**

1. 16    3.    5. 5    7. 3



9.  $10^{25}$     11.  $\frac{1}{2}$     13.  $\frac{1}{16}$     15. 25    17. 81    19. -200

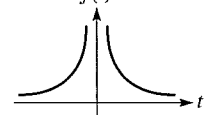
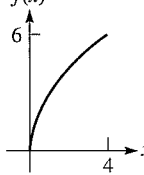
21.  $\frac{3}{5}$     23. -2    25.  $\frac{39}{1000}$     27.  $\frac{3}{5}$     29. 2.059

31. 0.53891    33.  $B^{7/6}$     35.  $\frac{1}{-y^{9/10}}$     37.  $\frac{1}{x^{3/2}}$     39.  $2ab^2$

41.  $\frac{1}{8a^3b^{9/4}}$     43.  $a^{1/12}$     45.  $\frac{4x}{(4x^2+1)^{1/2}}$     47. -y

49.  $\frac{T}{(T+2)^{1/2}}$     51.  $\frac{a^2+1}{a^4}$     53.  $\frac{a+1}{a^{1/2}}$     55.  $\frac{5x^2-2x}{(2x-1)^{1/2}}$

57.  $f(x)$     59.  $f(t)$     61.  $\sqrt[3]{x^2}$



63. If  $(A/S)^{-1/4} = 0.5 = 1/2$ , then  $(A/S)^{1/4} = 2$ . Raise each to the fourth power and get  $A/S = 16$ .

65.  $R = \frac{T^{2/3}}{k^{1/3}} - d$     67. 1.91 mA