

$$61. f^{-1}(x) = \frac{2}{\sqrt{1-2x}}$$

$$f(f^{-1}(x)) = \frac{\frac{4}{1-2x} - 4}{2 \cdot \frac{4}{1-2x}} = \frac{4 - 4(1-2x)}{2 \cdot 4} = \frac{8x}{8} = x$$

$$f^{-1}(f(x)) = \frac{2}{\sqrt{1-2\left(\frac{x^2-4}{2x^2}\right)}} = \frac{2}{\sqrt{\frac{4}{x^2}}} = \sqrt{x^2} = x, \text{ since } x > 0.$$

Domain $f = \{x|x > 0\}$ or $(0, \infty)$

Range $f = \text{Domain } f^{-1} = \left\{x \mid x < \frac{1}{2}\right\}$ or $\left(-\infty, \frac{1}{2}\right)$

$$62. f^{-1}(x) = \sqrt{\frac{3}{3x-1}}$$

$$f(f^{-1}(x)) = \frac{\frac{3}{3x-1} + 3}{3\left(\frac{3}{3x-1}\right)} = \frac{3 + 3(3x-1)}{9} = \frac{9x}{9} = x$$

$$f^{-1}(f(x)) = \sqrt{\frac{3}{3\left(\frac{x^2+3}{3x^2}\right) - 1}} = \sqrt{\frac{3x^2}{(x^2+3) - x^2}} = \sqrt{\frac{3x^2}{3}} = \sqrt{x^2} = x, \text{ since } x > 0$$

Domain $f = \{x|x > 0\}$

Range $f = \text{Domain } f^{-1} = \left\{x \mid x > \frac{1}{3}\right\}$

63. (a) 0 (b) 2 (c) 0 (d) 1 64. (a) $\frac{1}{2}$ (b) 0 (c) 1 (d) 0 65. $f^{-1}(x) = \frac{1}{m}(x-b), m \neq 0$
66. $f^{-1}(x) = \sqrt{r^2 - x^2}, 0 \leq x \leq r$ 67. Quadrant I 68. Quadrant IV
69. Possible answer: $f(x) = |x|, x \geq 0$, is one-to-one; $f^{-1}(x) = x, x \geq 0$
70. Possible answer: $f(x) = x^4, x \geq 0$, is one-to-one; $f^{-1}(x) = x^{1/4}, x \geq 0$ 71. (a) $C(H) = \frac{H + 10.53}{2.15}$ (b) 16.99 in.
72. $f(g(x)) = \frac{9}{5}\left[\frac{5}{9}(x-32)\right] + 32 = x; g(f(x)) = \frac{5}{9}\left[\left(\frac{9}{5}x + 32\right) - 32\right] = x$ 73. $x(p) = \frac{300-p}{50}, p \leq 300$ 74. $l(T) = \frac{gT^2}{4\pi^2}, T > 0$
75. $f^{-1}(x) = \frac{-dx+b}{cx-a}; f = f^{-1}$ if $a = -d$ 76. Yes, the graph must be symmetric about the line $y = x$; $y = \frac{1}{x}$ is an example.
78. Possible answer: $y = \begin{cases} \frac{1}{x}, & x < 0 \\ x, & x \geq 0 \end{cases}$ is neither an increasing nor a decreasing function on its domain, but is one-to-one.
79. Yes, if the domain is $\{x|x \geq 0\}$. 80. No 81. On the line $y = x$. No. No.

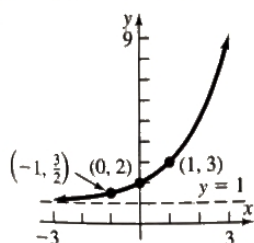
5.3 Concepts and Vocabulary (page 423)

6. $\left(-1, \frac{1}{a}\right), (0, 1), (1, a)$ 7. 1 8. 4 9. False 10. False

5.3 Exercises (page 423)

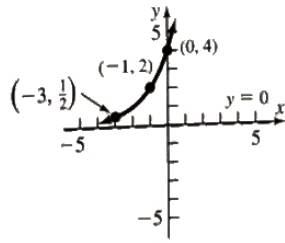
11. (a) 11.212 (b) 11.587 (c) 11.664 (d) 11.665 12. (a) 15.426 (b) 16.189 (c) 16.241 (d) 16.242
13. (a) 8.815 (b) 8.821 (c) 8.824 (d) 8.825 14. (a) 6.498 (b) 6.543 (c) 6.580 (d) 6.581
15. (a) 21.217 (b) 22.217 (c) 22.440 (d) 22.459 16. (a) 21.738 (b) 22.884 (c) 23.119 (d) 23.141
17. 3.320 18. 0.273 19. 0.427 20. 8.166 21. Not exponential 22. Not exponential 23. Exponential; $a = 4$
24. Exponential; $a = \frac{3}{2}$ 25. Exponential; $a = 2$ 26. Not exponential 27. Not exponential 28. Exponential; $a = \frac{1}{2}$
29. B 30. F 31. D 32. H 33. A 34. C 35. E 36. G

37.



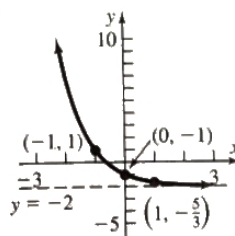
Domain: All real numbers
Range: $\{y|y > 1\}$ or $(1, \infty)$
Horizontal asymptote: $y = 1$

38.



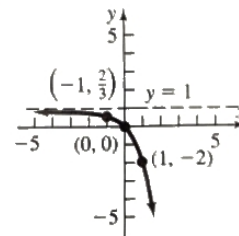
Domain: All real numbers
Range: $\{y|y > 0\}$ or $(0, \infty)$
Horizontal asymptote: $y = 0$

39.



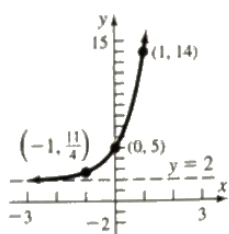
Domain: All real numbers
Range: $\{y|y > -2\}$ or $(-2, \infty)$
Horizontal asymptote: $y = -2$

40.



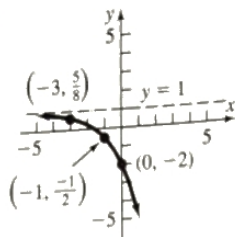
Domain: All real numbers
Range: $\{y|y < 1\}$ or $(-\infty, 1)$
Horizontal asymptote: $y = 1$

41.



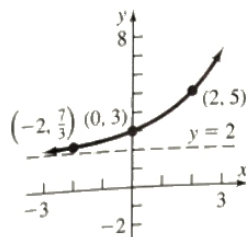
Domain: All real numbers
Range: $\{y|y > 2\}$ or $(2, \infty)$
Horizontal asymptote: $y = 2$

42.



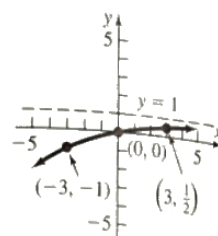
Domain: All real numbers
Range: $\{y|y < 1\}$ or $(-\infty, 1)$
Horizontal asymptote: $y = 1$

43.



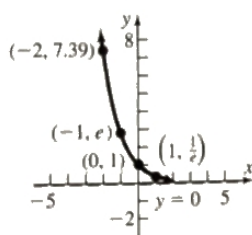
Domain: All real numbers
Range: $\{y|y > 2\}$ or $(2, \infty)$
Horizontal asymptote: $y = 2$

44.



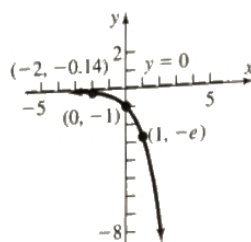
Domain: All real numbers
Range: $\{y|y < 1\}$ or $(-\infty, 1)$
Horizontal asymptote: $y = 1$

45.



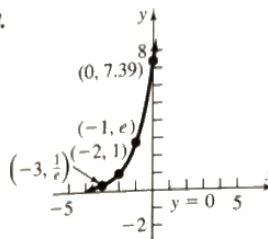
Domain: All real numbers
Range: $\{y|y > 0\}$ or $(0, \infty)$
Horizontal asymptote: $y = 0$

46.



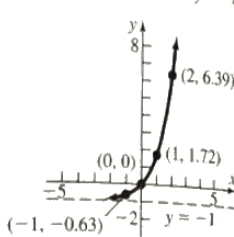
Domain: All real numbers
Range: $\{y|y < 0\}$ or $(-\infty, 0)$
Horizontal asymptote: $y = 0$

47.



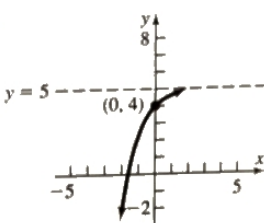
Domain: All real numbers
Range: $\{y|y > 0\}$ or $(0, \infty)$
Horizontal asymptote: $y = 0$

48.



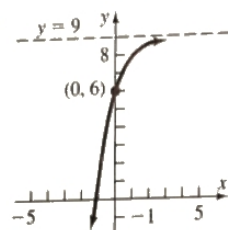
Domain: All real numbers
Range: $\{y|y > -1\}$ or $(-1, \infty)$
Horizontal asymptote: $y = -1$

49.



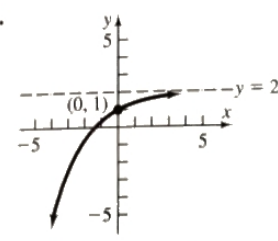
Domain: All real numbers
Range: $\{y|y < 5\}$ or $(-\infty, 5)$
Horizontal asymptote: $y = 5$

50.



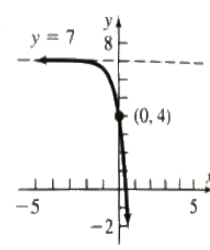
Domain: All real numbers
Range: $\{y|y < 9\}$ or $(-\infty, 9)$
Horizontal asymptote: $y = 9$

51.



Domain: All real numbers
Range: $\{y|y < 2\}$ or $(-\infty, 2)$
Horizontal asymptote: $y = 2$

52.



Domain: All real numbers
Range: $\{y|y < 7\}$ or $(-\infty, 7)$
Horizontal asymptote: $y = 7$

53. $\frac{1}{2}$ 54. 1 55. $\{-\sqrt{2}, 0, \sqrt{2}\}$ 56. $\{0, \frac{1}{2}\}$ 57. $\{1 - \frac{\sqrt{6}}{3}, 1 + \frac{\sqrt{6}}{3}\}$ 58. $\frac{1}{2}$ 59. 0 60. 3 61. 4 62. 0 63. $\frac{3}{2}$ 64. $\frac{3}{4}$

65. $\{1, 2\}$ 66. $\{-6, 2\}$ 67. $\frac{1}{49}$ 68. $\frac{1}{9}$ 69. $\frac{1}{4}$ 70. $\frac{1}{27}$

71. $f(x) = 3^x$ 72. $f(x) = 5^x$ 73. $f(x) = -6^x$ 74. $f(x) = -e^x$

75. (a) 74% (b) 47% 76. (a) 568.68 mm Hg (b) 178.27 mm Hg 77. (a) 44.3 watts (b) 11.6 watts

78. (a) 34.99 sq mm (b) 3.02 sq mm 79. 3.35 mg; 0.45 mg 80. 362 students

81. (a) 0.63 (b) 0.98 (c) 1

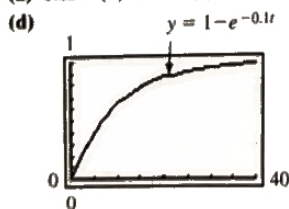
82. (a) 0.895 (b) 0.989 (c) 1

83. (a) 5.16% (b) 8.88%

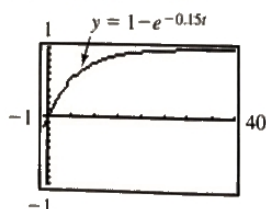
84. (a) 0.156 (b) 0.030

85. (a) \$12, 123 (b) \$6443

86. (a) 83 words (b) 153 words

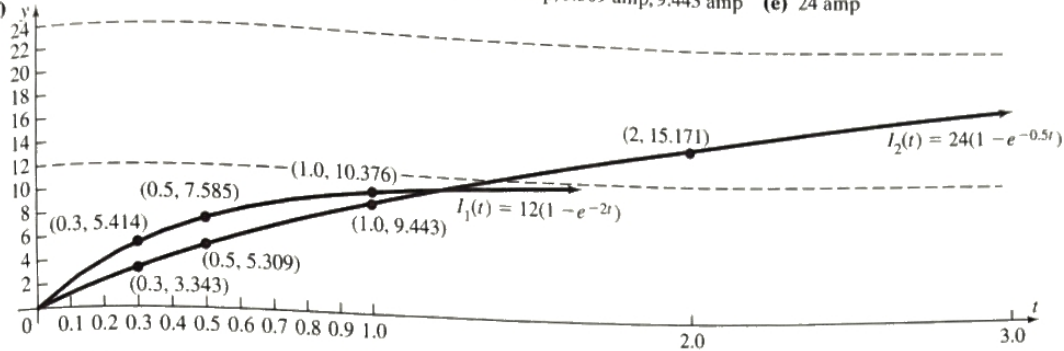


(e) About 7 min

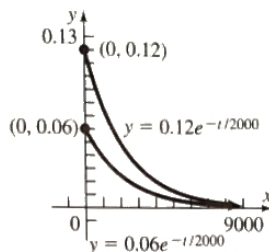
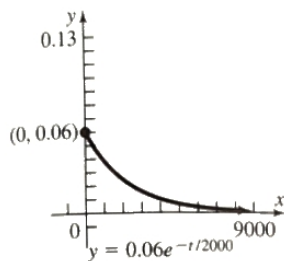


(e) About 6 min

87. (a) 5.414 amp, 7.585 amp, 10.376 amp (b) 12 amp (d) 3.343 amp, 5.309 amp, 9.443 amp (e) 24 amp
 (c), (f)



88. (a) 0.06 amp; 0.0364 amp; 0.0134 amp (b) 0.06 amp
 (c) (d) 0.12 amp; 0.0728 amp; 0.0268 amp
 (e) 0.12 amp
 (f)



89. $n = 4$: 2.7083; $n = 6$: 2.7181;
 $n = 8$: 2.7182788; $n = 10$: 2.7182818
 90. 2.71826332
 $e \approx 2.718281828$

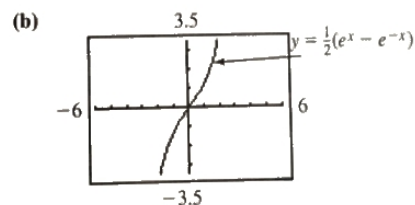
$$91. \frac{f(x+h) - f(x)}{h} = \frac{a^{x+h} - a^x}{h} = \frac{a^x a^h - a^x}{h} = \frac{a^x(a^h - 1)}{h} \quad 92. f(A+B) = a^{A+B} = a^A \cdot a^B = f(A) \cdot f(B)$$

$$93. f(-x) = a^{-x} = \frac{1}{a^x} = \frac{1}{f(x)} \quad 94. f(\alpha x) = a^{\alpha x} = (a^x)^\alpha = [f(x)]^\alpha$$

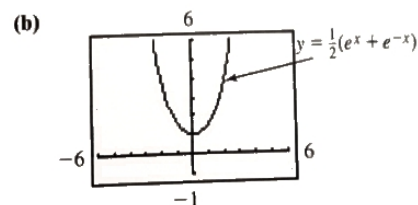
$$95. (a) 70.95\% \quad (b) 72.62\% \quad (c) 100\%$$

$$96. f(1) = 5, f(2) = 17, f(3) = 257, f(4) = 65,537, \\ f(5) = 4,294,967,297 = 641 \times 6,700,417$$

$$97. (a) f(-x) = \frac{1}{2}(e^{-x} - e^{-(-x)}) = \frac{1}{2}(e^{-x} - e^x) \\ = -\frac{1}{2}(e^x - e^{-x}) = -f(x)$$



$$98. (a) f(-x) = \frac{1}{2}(e^{-x} + e^{-(-x)}) = \frac{1}{2}(e^{-x} + e^x) \\ = \frac{1}{2}(e^x + e^{-x}) = f(x)$$



$$(c) (\cosh x)^2 - (\sinh x)^2 = \left[\frac{1}{2}(e^x + e^{-x}) \right]^2 - \left[\frac{1}{2}(e^x - e^{-x}) \right]^2 \\ = \frac{1}{4}[e^{2x} + 2 + e^{-2x} - e^{2x} + 2 - e^{-2x}] \\ = \frac{1}{4}[4] = 1$$