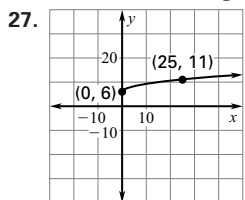


sandwiches have fewer calories than the sandwiches at the first restaurant. The histograms show that half of the sandwiches in the 1st restaurant contain over 500 calories while only 1 out of 10 sandwiches in the second restaurant contain over 500 calories.

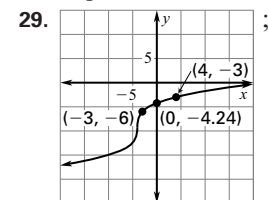
CHAPTER 7 REVIEW (pp. 456–458) 1. 2 3. $\frac{1}{243}$ 5. -2

7. -1 9. $\frac{1}{25}$ 11. $\frac{\sqrt[3]{2}}{5}$ 13. $3x^{1/4}$ 15. $xyz\sqrt[6]{6yz^4}$ 17. $3x - 6$

17. $3x - 6$ 19. $2x^2 - 8x + 8$ 21. $2x - 8$ 23. $f^{-1}(x) = (-x)^{1/4}$, $x \leq 0$ 25. Both compositions equal x .



$x \geq 0; y \geq 6$



x and y are all real numbers.

31. -3 33. 40.9, 42, 51, 42, 11.3

CHAPTER 8

SKILL REVIEW (p. 464) 1. $\frac{1}{64}$ 2. $\frac{1}{9}$ 3. 1 4. -25 5. $\frac{2}{5}$

6. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

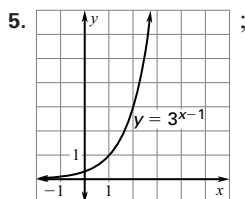
7. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

8. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

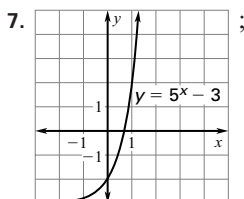
9. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

10. Sample answer: $y = 0.403x + 2.013$

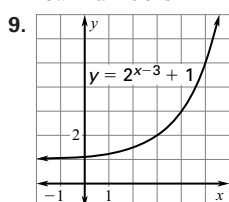
8.1 PRACTICE (pp. 469–471)



domain: all real numbers;
range: all positive real numbers



domain: all real numbers;
range: $y > -3$

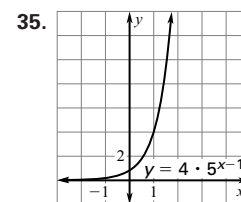
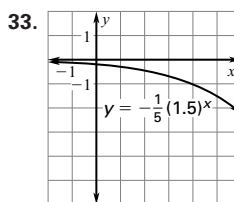
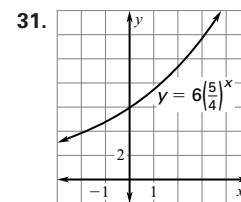
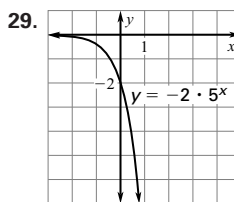
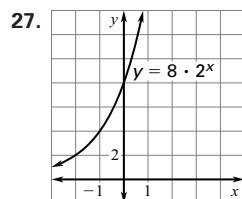
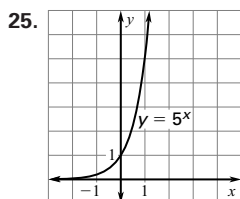


domain: all real numbers;
range: $y > 1$

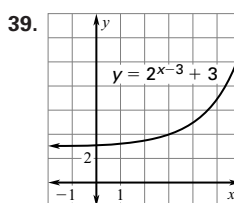
11. 6191; 4% 13. 1; the x -axis

15. 4; the x -axis 17. $\frac{3}{2}$; the x -axis

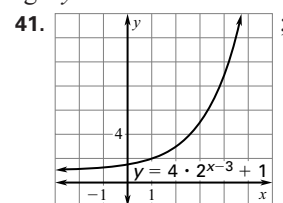
19. C 21. B 23. F



domain: all real numbers;
range: $y > 0$



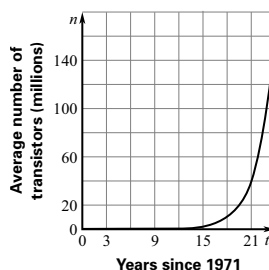
domain: all real numbers;
range: $y > 3$



domain: all real numbers;
range: $y > 1$

43. 2.91 trillion ft^3 ; 1.07; 7%

47.



45. 8.03 trillion ft^3

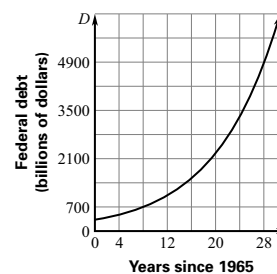
49. $E = 5(1.59)^t$;

about 32 gigawatt-hours

51. $t \approx 5.98$;

near the end of 1985

53. **Federal Debt**



55. a. \$2600 b. \$3041.63

c. ANS + ANS $\times 0.01$;
push “ENTER” four
times. d. \$3050.48;
this is \$8.85 more.

57. $A = 400(1.005)^{4t}$
where t is the number of
years 59. \$1724.48

61. \$1799.78 63.
\$2402.21

8.1 MIXED REVIEW (p. 472) 71. $\frac{1}{8}$ 73. $\frac{1}{32}$ 75. $\frac{343}{1728}$

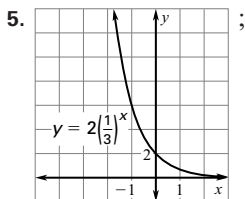
77. $\frac{16}{25}$ 79. 2.18 81. -3 83. 3.16 85. 3 87. 3.04 89. 1.73

91. $4x^2 + 6x - 11$; all real numbers 93. $24x^3 - 44x^2$;
all real numbers 95. $24x^2 - 11$; all real numbers

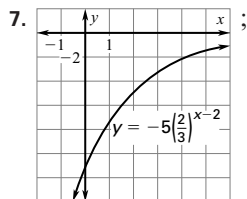
97. $\frac{6x - 11}{4x^2}$; all nonzero real numbers

99. $36x - 77$; all real numbers

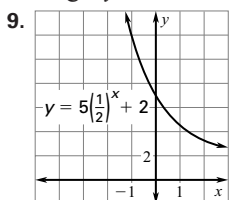
8.2 PRACTICE (pp. 477–479)



domain: all real numbers;
range: $y > 0$



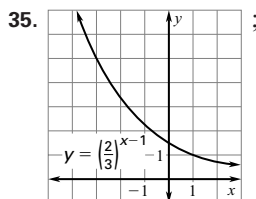
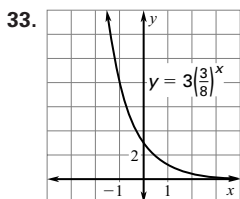
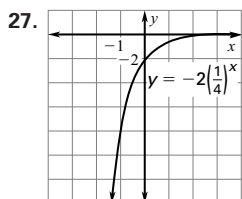
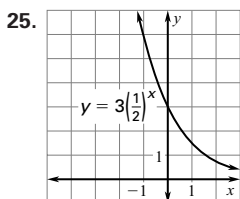
domain: all real numbers;
range: $y < 0$



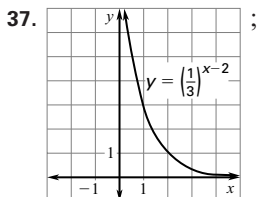
domain: all real numbers;
range: $y > 2$

- 11. exponential decay
- 13. exponential decay
- 15. exponential growth
- 17. exponential decay

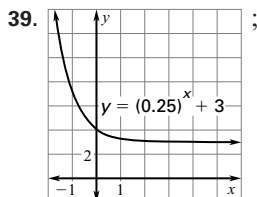
19. F 21. D 23. C



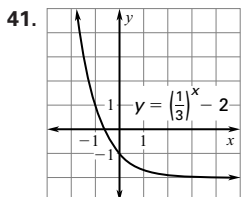
domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y > 0$

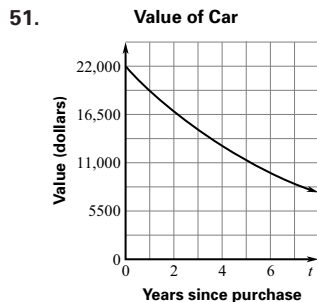


domain: all real numbers;
range: $y > 3$



domain: all real numbers;
range: $y > -2$

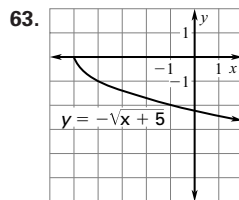
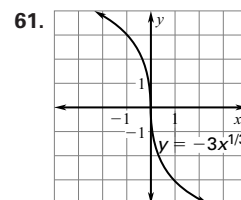
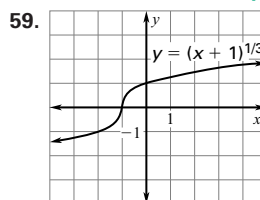
- 43. $V = 780(0.95)^t$
- 45. $i = 400(0.71)^h$
- 47. 265; 0.39; 61%
- 49. about 1988



- 53. $V = 2100(0.5)^t$; \$525
- 55. after about 22 months

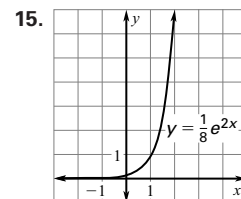
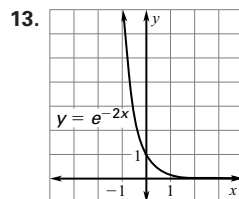
- 57. a. $V = 18,354(0.83)^t$
- b. $A(n) = \left(18,354 - \frac{280}{0.085} \cdot \frac{1}{12}\right) \left(1 + \frac{0.085}{12}\right)^n + \frac{280}{0.085} \cdot \frac{1}{12}$

8.2 MIXED REVIEW (p. 479)



- 65. 16; 15; 15; 12
- 67. a. \$2639.86 b. \$2441.79

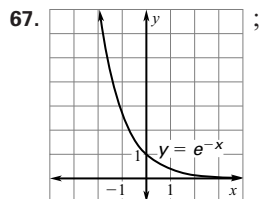
8.3 PRACTICE (pp. 483–485) 5. $3e^5$ 7. $\frac{64}{e^6}$ 9. $6e^{2x}$ 11. $\frac{e^6}{3}$



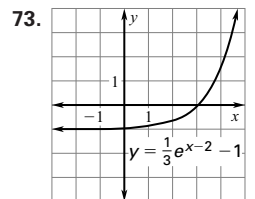
- 17. e^6 19. $\frac{e^{3x}}{3}$ 21. $3e^4$ 23. e^{-2x+5} 25. $\frac{1}{10,000e^x}$

- 27. $\frac{e^{x-1}}{2}$ 29. $3e^{2x}$ 31. $\frac{3}{2}e^{3x-1}$ 33. 20.086 35. 5.474

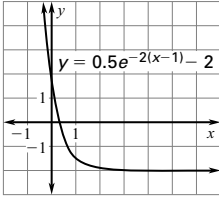
- 37. 0.779 39. 2980.958 41. 0.018 43. -0.199
- 45. -178.096 47. $4.34 \cdot 10^{-20}$ 49. exponential decay
- 51. exponential decay 53. exponential growth
- 55. exponential growth 57. exponential decay
- 59. exponential decay 61. C 63. F 65. D



domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y > -1$

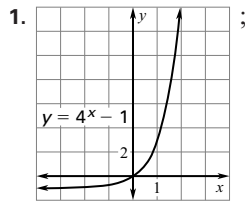
75.  ; domain: all real numbers; range: $y > -2$

77. \$2650; \$2652.25; \$2653.41; \$2654.19; \$2654.59;
Sample answer: The extra amount of interest earned with more and more compoundings decreases drastically, with the difference between compounding monthly and continuously being only 40¢, 0.016% of the amount initially invested. 79. about 4.603 lb/in.²

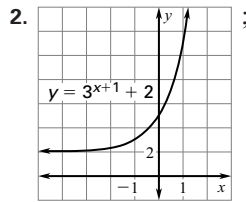
8.3 MIXED REVIEW (p. 485) 85. $f^{-1}(x) = \frac{x-7}{6}$

87. $f^{-1}(x) = 2x + 20$ 89. $f^{-1}(x) = -5x - 65$ 91. 6.2 93. 2
 95. no solution

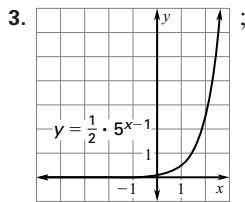
QUIZ 1 (p. 485)



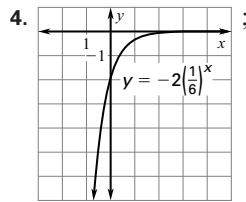
domain: all real numbers;
 range: $y > -1$



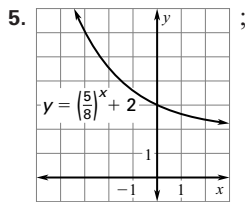
domain: all real numbers;
 range: $y > 2$



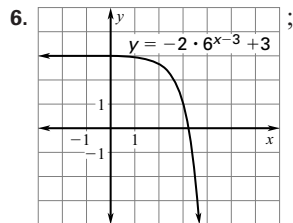
domain: all real numbers;
 range: $y > 0$



domain: all real numbers;
 range: $y < 0$



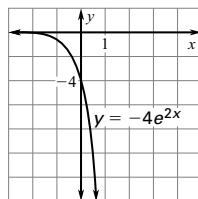
domain: all real numbers;
 range: $y > 2$



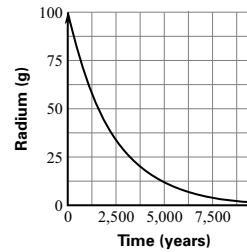
domain: all real numbers;
 range: $y < 3$

7. $2e^7$ 8. $4e^2$ 9. $9e^{4x}$ 10. $\frac{e^{12x}}{5^{4x}}$ 11. $\frac{3}{4}e^{x-1}$ 12. $\frac{6}{e^{4x}}$

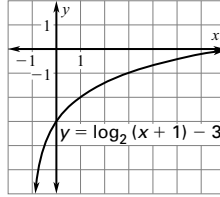
13. $4e^{\sqrt{x}}$ 14. $5e^{2x}$ 15.



16. **Amount of Radium Left from a 100 g Sample** ; about 1.357 g



8.4 PRACTICE (pp. 490–492) 5. $3^2 = 9$ 7. $(\frac{1}{2})^{-2} = 4$ 9. 6

11. 0 13.  ; domain: $x > -1$;
 range: all real numbers

15. about 0.316 mm

17. $5^{-1} = \frac{1}{5}$

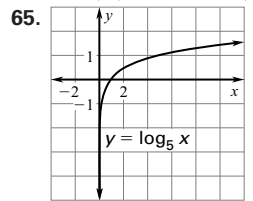
19. $8^3 = 512$

21. $14^2 = 196$ 23. $105^2 = 11,025$ 25. 3 27. 1 29. 2

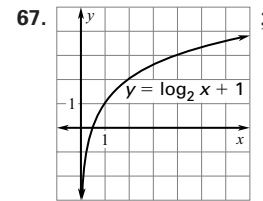
31. 4 33. -0.38 35. -2 37. 2.303 39. 0.571 41. -0.523

43. 0.544 45. 5.011 47. 3.114 49. x 51. x 53. x 55. $3x$

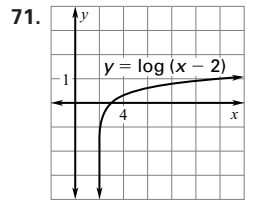
57. $y = (\frac{1}{4})^x$ 59. $y = (\frac{1}{2})^x$ 61. $y = \frac{e^x}{6}$ 63. $y = -2 + e^x$



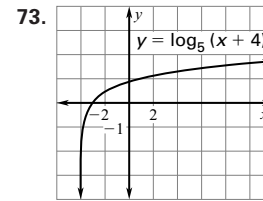
domain: $x > 0$;
 range: all real numbers



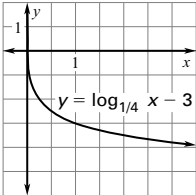
domain: $x > 0$;
 range: all real numbers



domain: $x > 2$;
 range: all real numbers



domain: $x > -4$;
 range: all real numbers

75.  ; domain: $x > 0$;
 range: all real numbers

77. a. 2.4 b. 3 c. 3.5

79. about 8 (7.9982...)

81. about 205 mi

8.4 MIXED REVIEW (p. 492) 93. 3125 95. 7 97. $\frac{1}{6}$ 99. 64

101. 16 103. $\frac{1}{16}$ 105. $2x - 7 + \frac{27}{x+4}$ 107. $4x + 3 - \frac{6x+9}{x^2+2}$

109. $y = -\frac{1}{6}x(x-2)(x+3)$ 111. $y = \frac{1}{75}(x-4)(x-6)(x+4)$

- 8.5 PRACTICE (pp. 496–498)** 5. 3 7. -1 9. 1.58 11. 7.2
 13. about 26 decibels 15. -2 17. 3 19. -1 21. -6
 23. 1.398 25. 2.097 27. 2.352 29. -0.477 31. $\ln 22 + \ln x$
 33. $6 \log_6 x$ 35. $2 \log_3 5$ 37. $\ln 3 + \ln x + 3 \ln y$
 39. $2 + 2 \log_8 x$ 41. $\frac{5}{6} \log_3 12 + 9 \log_3 x$
 43. $\ln 3 + 4 \ln y - 3 \ln x$ 45. $1 + \frac{1}{2} \log_2 x$ 47. $\ln 4$
 49. $\log_{16} 1296$ 51. $\log_4 128x^5y^3$ 53. $\log_3 2\sqrt{y}$ 55. $\ln \frac{3}{x^2}$
 57. $\log_5 \frac{1}{6}$ 59. 1.277 61. 1.465 63. 1.226 65. 2.153
 67. 1.774 69. 1.585 71. -0.529 73. 1.471

f	s
1.414	1.000
2.000	2.000
2.828	3.000
4.000	4.000
5.657	5.000
8.000	6.000
11.314	7.000
16.000	8.000

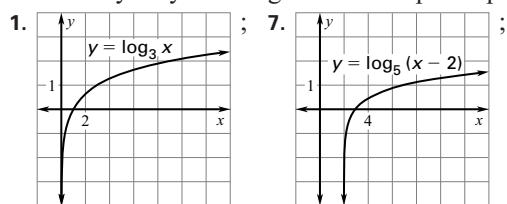
75. The first row of the table shows successive powers of $\sqrt{2}$, and the second row shows the integers, beginning with 1.
 77. $E = 1.4 \log \frac{C_2}{C_1}$
 79. about 1.089 kcal/g-molecule
 81. about 95 decibels; between subway train and boiler shop
 83. about 92 decibels

85. 10 log 0.5, or about 3 decibels less

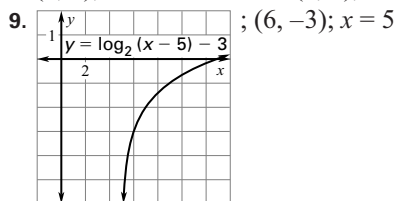
- 8.5 MIXED REVIEW (p. 499)** 93. y^{12} 95. $9x^4$
 97. $\frac{x^2}{y^2}$ 99. $\frac{xy^8}{2}$ 101. 7 103. 500 105. 6.14×10^{-6}
 107. 3.581×10^{-3} 109. 0.238 111. 1.773

TECHNOLOGY ACTIVITY 8.5 (p. 500)

Points may vary. Points given are sample responses.



(1, 0); $x = 0$ (3, 0); $x = 2$



; (6, -3); $x = 5$

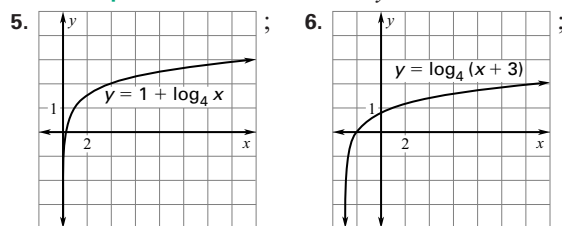
13. *Sample answer:* The domain of $y = \log x$ is all real numbers greater than 0, while that of $y = \log |x|$ is all real numbers except 0. The graph of $y = \log |x|$ is the graph of $y = \log x$ and its reflection in the y -axis.

- 8.6 PRACTICE (pp. 505–507)** 5. 1.292 7. 1 9. $\frac{\log 28 + 1}{3} \approx 0.816$ 11. 1000 13. 39.121 15. $-1 + \frac{\sqrt{39}}{3} \approx 1.082$

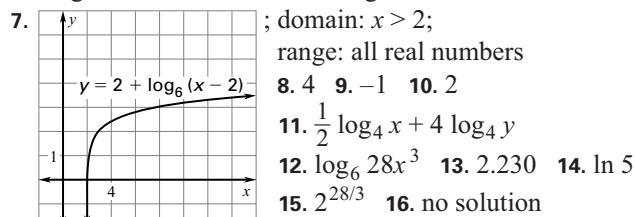
17. $e^{\log_2 5x} \neq 5x$, since e^x and $\log_2 x$ are not inverse functions. 19. yes 21. no 23. yes 25. 1 27. $-\frac{7}{5}$ 29. $\frac{16}{3}$
 31. 3.907 33. $\frac{3}{2}$ 35. $\frac{\log 5}{2} \approx 0.3495$ 37. 1
 39. $-\frac{1}{12} \log 94 \approx -0.164$ 41. 20 43. 2 45. 2187 47. 2916
 49. $-e^{7/2}$ 51. $1 + \sqrt{1+e} \approx 2.928$ 53. no solution
 55. $\frac{1}{3}e^5$ 57. 47.158 59. no solution
 63. a little over 9 years 65. about 27.7 years
 67. Subantarctic: 8° ; Antarctic intermediate: 4° ; North Atlantic deep: 2° ; Antarctic bottom: 0° 69. 100 mm

- 8.6 MIXED REVIEW (p. 508)** 77. Lines may vary;
 $y = 0.305x + 1.780$ 79. (4, 5) 81. (0, -6) 83. no solution
 85. $(3x^2 + 4)(x - 2)$ 87. $(x^2 + 5)(7x + 4)$

QUIZ 2 (p. 508) 1. 3 2. 4 3. 3 4. $y = e^x - 3$

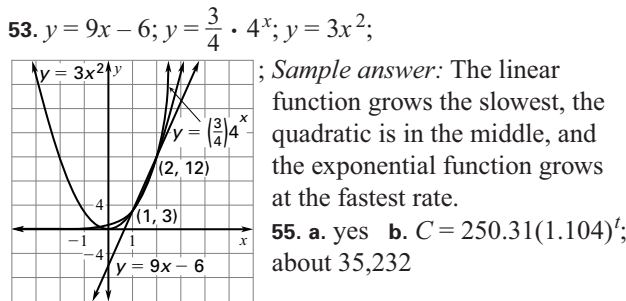
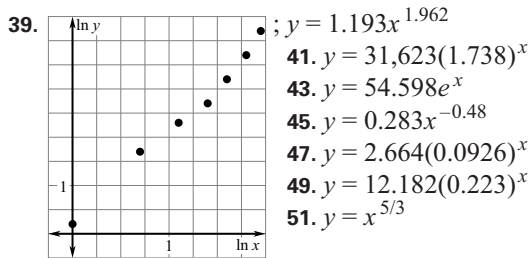


domain: $x > 0$; range: all real numbers domain: $x > -3$; range: all real numbers



17. about 87 billion ergs

- 8.7 PRACTICE (pp. 513–516)** 5. $y = \frac{2}{9} \cdot 3^x$
 7. $y = \frac{2704}{350} \left(\frac{35}{52}\right)^x$ 9. $y = \frac{1}{\sqrt{3}} \left(\frac{\sqrt{3}}{2}\right)^x$ 11. $y = 2x^2$
 13. $y = 4x^{0.631}$ 15. $y = 0.417x^{0.263}$ 17. $y = \left(\frac{4}{3}\right)^{3x}$
 19. $y = \left(\frac{1}{512}\right)^{4x}$ 21. $y = 2^x$ 23. $y = 7\left(\frac{2}{3}\right)^x$ 25. $y = \left(\frac{1}{4}\right)^{5x}$
 27. ; *Sample answer:*
 $y = 9.715(1.550)^x$
 29. $y = 0.362x^{1.465}$
 31. $y = 0.358x^{2.181}$
 33. $y = 6.325x^{0.661}$
 35. $y = 7.109x^{0.482}$
 37. $y = 2.481x^{0.954}$



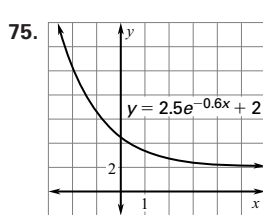
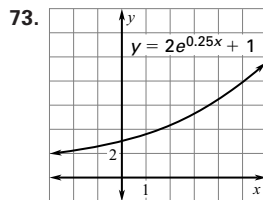
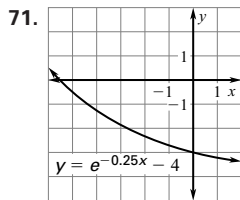
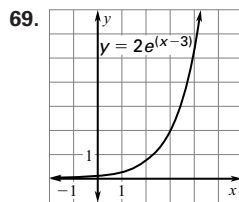
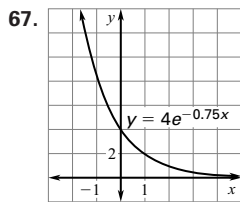
57. a. yes b. $y = 2.022x^{-0.582}$; about 354,000

8.7 MIXED REVIEW (p. 516)

61. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

63. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

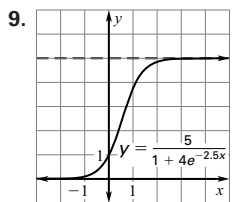
65. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$



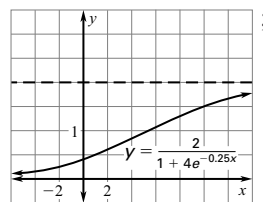
77. $\log 27$ 79. $\ln \frac{x^2}{4}$

81. $\log_7 3840$

8.8 PRACTICE (pp. 520–522) 5. 0.0438 7. 0.822



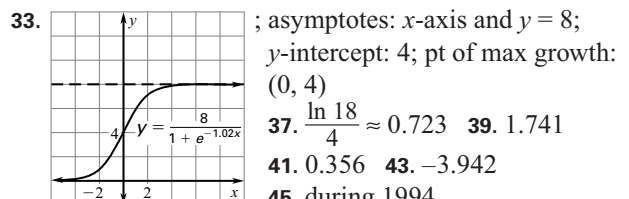
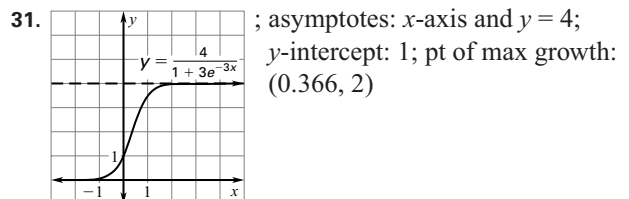
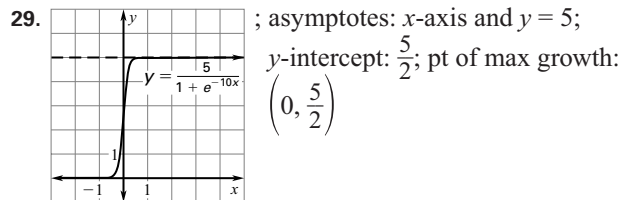
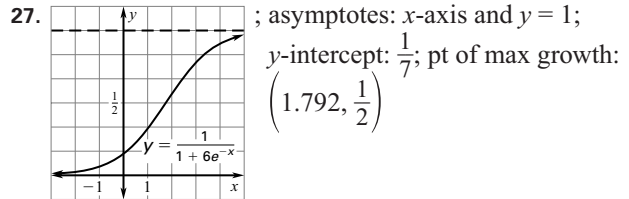
x -axis and $y = 5$; 1;
 (0.555, 2.5)



x -axis and $y = 2$; $\frac{2}{5}$;
 (5.545, 1)

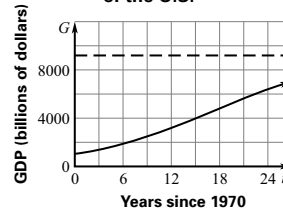
13. 0.693 15. $h = \frac{117}{1 + 18e^{-0.73t}}$ 17. 6.090 19. 0.00578

21. 2.896 23. 0.835 25. A



47. to approach 91.86 million households

49. **Gross Domestic Product of the U.S.** ; 51. $y = \frac{721}{1 + 72e^{-0.526t}}$



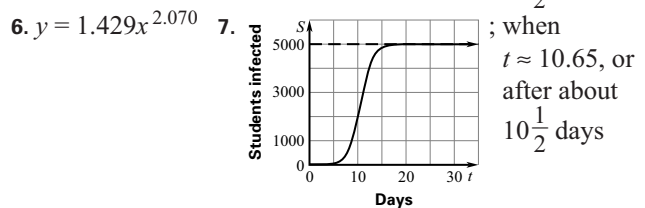
1987

8.8 MIXED REVIEW (p. 522) 55. $y = -2x$ 57. $y = \frac{1}{8}x$

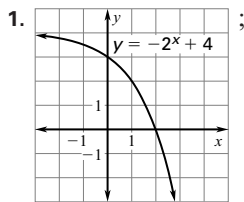
59. $y = 0.2x$ 61. $y = 2.560(0.0872)^x$ 63. $y = 0.0174x^{-0.75}$

QUIZ 3 (p. 522) 1. $y = 1.191(1.587)^x$ 2. $y = 9.541(1.677)^x$

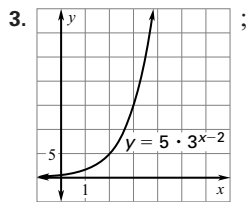
3. $y = 0.936(1.573)^x$ 4. $y = 10.693x^{1.389}$ 5. $y = \frac{1}{2}x^{2.547}$



CHAPTER 8 REVIEW (pp. 524–526)

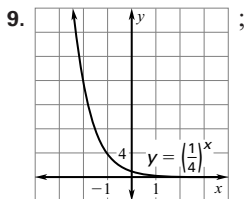


domain: all real numbers;
range: $y < 4$

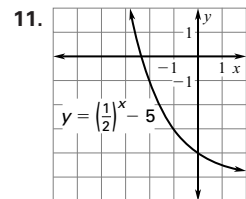


domain: all real numbers;
range: $y > 0$

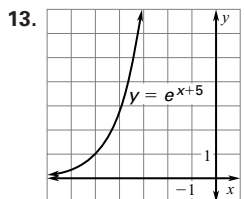
5. exponential decay 7. exponential decay



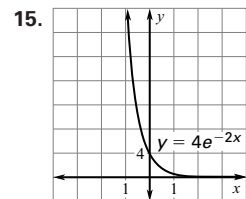
domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y > -5$

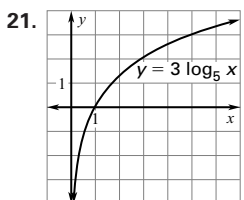


domain: all real numbers;
range: $y > 0$

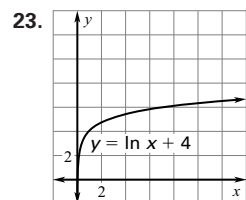


domain: all real numbers;
range: $y > 0$

17. 3 19. -2



domain: $x > 0$;
range: all real numbers



domain: $x > 0$;
range: all real numbers

25. $\log_3 6 + \log_3 x + \log_3 y$ 27. $\log 5 + 3 \log x$

29. $\ln \frac{9}{5}$ 31. $\log 18$ 33. -1.466 35. 160.49

37. $y = 3.9605(1.499)^x$ 39. $y = 2.099x^{0.696}$

41. $y = 3.188x^{1.673}$

43. 

asymptotes: x -axis and $y = 4$;
 y -intercept: $\frac{4}{3}$; pt of max growth:
(0.231, 2)

CHAPTER 9

SKILL REVIEW (p. 532) 1. $y = \frac{5}{2}x$ 2. $y = \frac{1}{10}x$

3. $y = -\frac{1}{4}x$ 4. $y = -4x$ 5. $15x - 5$ 6. $x^3 + 7x^2 + 8x - 16$

7. $-x^3 + 5x$ 8. $x^3 + 7x^2 - 8x$ 9. $(x-3)^2$
10. $4(x-1)(x^2+x+1)$ 11. $2x(2x-9)(2x+9)$
12. $(2x-1)(3x+5)$ 13. 0, -2 14. -5, 3 15. -1, 4

9.1 PRACTICE (pp. 537–539) 5. direct variation 7. inverse variation 9. inverse variation 11. neither 13. yes 15. yes 17. yes 19. yes 21. inverse variation 23. neither

25. inverse variation 27. direct variation 29. $y = -\frac{10}{x}$; -5

31. $y = \frac{7}{x}$; 3.5 33. $y = -\frac{4}{x}$; -2 35. inverse variation

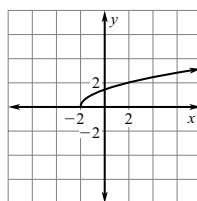
37. neither 39. $z = \frac{1}{4}xy$; -7 41. $z = 15xy$; -420

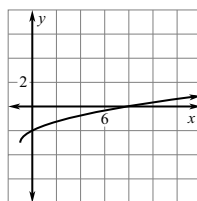
43. $z = 32xy$; -896 45. $x = \frac{kz}{y}$ 47. $w = \frac{kzy}{x}$

49. yes; $l = \frac{45\pi}{8A}$ 51. $D = \frac{k\sqrt{L}}{T^2}$ 53. 139,000,000 km

55. $W = \frac{49}{5}mh$; 1470 joules 57. 285 watts

9.1 MIXED REVIEW (p. 539)

61. ; domain: all real numbers x such that $x \geq -2$; range: all real numbers y such that $y \geq 0$

63. ; domain: all real numbers x such that $x \geq -1$; range: all real numbers y such that $y \geq -3$

65. 128 67. 113 69. 7

9.2 PRACTICE (pp. 543–545) 5. $y = 2$; $x = -4$ 7. $y = \frac{1}{2}$; $x = 2$

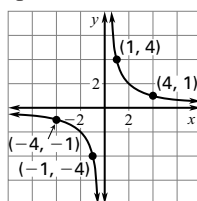
9. $y = -5$; $x = 6$ 11. $y = 2$; $x = 0$; domain: all real numbers except 0; range: all real numbers except 2

13. $y = -2$; $x = -3$; domain: all real numbers except -3; range: all real numbers except -2

15. $y = \frac{2}{3}$; $x = -\frac{1}{3}$; domain: all real numbers except $-\frac{1}{3}$; range: all real numbers except $\frac{2}{3}$

17. $y = -17$; $x = -43$; domain: all real numbers except -43; range: all real numbers except -17

19. $y = 19$; $x = 6$; domain: all real numbers except 6; range: all real numbers except 19

23. 

domain: all real numbers except 0; range: all real numbers except 0

25. 

domain: all real numbers except -5; range: all real numbers except -8