Section 5.3 *(page 409)*

Vocabulary Check *(page 409)*

1. change-of-base 2. $\frac{\log x}{\log a} = \frac{\ln x}{\ln a}$

3. c 4. a 5. b

1. (a) $\frac{\log x}{\log 5}$ (b) $\frac{\ln x}{\ln 5}$ 2. (a) $\frac{\log x}{\log 3}$ (b) $\frac{\ln x}{\ln 3}$

3. (a) $\frac{\log x}{\log \frac{1}{5}}$ (b) $\frac{\ln x}{\ln \frac{1}{5}}$ 4. (a) $\frac{\log x}{\log \frac{1}{3}}$ (b) $\frac{\ln x}{\ln \frac{1}{3}}$

5. (a) $\frac{\log \frac{3}{10}}{\log x}$ (b) $\frac{\ln \frac{3}{10}}{\ln x}$ 6. (a) $\frac{\log \frac{3}{4}}{\log x}$ (b) $\frac{\ln \frac{3}{4}}{\ln x}$

7. (a) $\frac{\log x}{\log 2.6}$ (b) $\frac{\ln x}{\ln 2.6}$ 8. (a) $\frac{\log x}{\log 7.1}$ (b) $\frac{\ln x}{\ln 7.1}$

9. 1.771 10. 0.712 11. -2.000 12. -1.161

13. -0.417 14. -0.694 15. 2.633 16. -3.823

17. $\frac{3}{2}$ 18. $4 + 4\log_2 3$ 19. $-3 - \log_5 2$

20. $\log 3 - 2$ 21. $6 + \ln 5$ 22. $\ln 6 - 2$ 23. 2

24. -3 25. $\frac{3}{4}$ 26. $\frac{1}{3}$ 27. 2.4 28. -0.8

29. -9 is not in the domain of $\log_3 x$.

30. -16 is not in the domain of $\log_2 x$.

31. 4.5 32. 12 33. $-\frac{1}{2}$ 34. $\frac{3}{4}$ 35. 7

36. 7 37. 2 38. 3 39. $\log_4 5 + \log_4 x$

40. $\log_3 10 + \log_3 z$ 41. $4\log_8 x$ 42. $\log y - \log 2$

43. $1 - \log_5 x$ 44. $-3\log_6 z$ 45. $\frac{1}{2}\ln z$

46. $\frac{1}{3}\ln t$ 47. $\ln x + \ln y + 2\ln z$

48. $\log 4 + 2\log x + \log y$ 49. $\ln z + 2\ln(z - 1)$

50. $\ln(x + 1) + \ln(x - 1) - 3\ln x$

51. $\frac{1}{2}\log_2(a - 1) - 2\log_2 3$ 52. $\ln 6 - \frac{1}{2}\ln(x^2 + 1)$

53. $\frac{1}{3}\ln x - \frac{1}{3}\ln y$ 54. $\ln x - \frac{3}{2}\ln y$

55. $4\ln x + \frac{1}{2}\ln y - 5\ln z$

56. $\frac{1}{2}\log_2 x + 4\log_2 y - 4\log_2 z$

57. $2\log_5 x - 2\log_5 y - 3\log_5 z$

58. $\log x + 4\log y - 5\log z$

59. $\frac{3}{4}\ln x + \frac{1}{4}\ln(x^2 + 3)$ 60. $\ln x + \frac{1}{2}\ln(x + 2)$

61. $\ln 3x$ **62.** $\ln yt$ **63.** $\log_4 \frac{z}{y}$ **64.** $\log_5 \frac{8}{t}$

65. $\log_2 (x+4)^2$ **66.** $\log_7 (z-2)^{2/3}$

67. $\log_3 \sqrt[4]{5x}$ **68.** $\log_6 \frac{1}{16x^4}$ **69.** $\ln \frac{x}{(x+1)^3}$

70. $\ln 64(z-4)^5$ **71.** $\log \frac{xz^3}{y^2}$ **72.** $\log_3 \frac{x^3y^4}{z^4}$

73. $\ln \frac{x}{(x^2-4)^4}$ **74.** $\ln \frac{z^4(z+5)^4}{(z-5)^2}$

75. $\ln \sqrt[3]{\frac{x(x+3)^2}{x^2-1}}$ **76.** $\ln \left(\frac{x^3}{x^2-1}\right)^2$

77. $\log_8 \frac{\sqrt[3]{y(y+4)^2}}{y-1}$ **78.** $\log_4 \left[x^6(x-1)\sqrt{x+1}\right]$

79. $\log_2 \frac{32}{4} = \log_2 32 - \log_2 4$; Property 2

80. $\log_7 \sqrt{70} = \frac{1}{2}(\log_7 7 + \log_7 10)$

$= \frac{1}{2} + \log_7 \sqrt{10}$; Properties 1 and 3

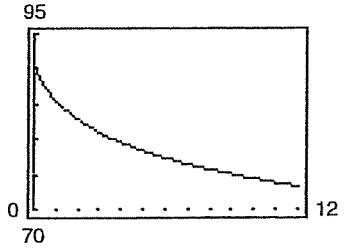
81. $\beta = 10(\log I + 12)$; 60 dB **82.** 24 dB difference

83. ≈ 3

84. (a) $90 - \log(t+1)^{15}$ (b) 90

(c) 79.5 (d) 73.3

(e)



(f) 9 months (g) $90 - 15 \log 10 = 75$