

# CHAPTER 7 REVIEW EXERCISES

## Section 7.1

Sketch the graphs of the following functions. State their domain and range.

1.  $f(x) = \left(\frac{1}{2}\right)^{x-1} + 3$

2.  $r(x) = 2^{-x+4} - 2$

3.  $h(x) = 3^x$

4.  $f(x) = 1 - 2^{-x}$

5.  $p(x) = \left(\frac{1}{4}\right)^x$

6.  $s(x) = (0.2)^{x-2}$

7.  $g(x) = 4 - 2^x$

8.  $m(x) = \frac{1}{2^x} - 3$

9.  $f(x) = \frac{1}{2^{4-x}}$

10.  $r(x) = \left(\frac{9}{2}\right)^{3-x}$

Solve the following exponential equations.

11.  $3^x = 243$

12.  $2^{-x} = 16$

13.  $0.5^x = 0.25$

14.  $3^{3x-5} = 81$

15.  $\left(\frac{2}{5}\right)^{-4x} = \left(\frac{25}{4}\right)^{x-1}$

16.  $10,000^x = 10^{-2x-12}$

17.  $9^{x-1} = 27^{-x+2}$

18.  $\left(\frac{1}{3}\right)^{x-1} = 81^{\frac{1}{2}}$

19.  $5^{3x-6} = 1$

## Section 7.2

20. Melissa has recently inherited \$15,000 that she wants to deposit into a savings account for 10 years. She has determined that her two best bets are an account that compounds annually at a rate of 3.95% and an account that compounds continuously at an annual rate of 3.85%. Which account would pay Melissa more interest?
21. Bill has come upon a 37-gram sample of iodine-131. He isolates the sample and waits for 2 weeks. After this time period, only 11 grams of iodine-131 remain. What is the half-life of this isotope?
22. Katherine is working in a lab testing bacteria populations. Starting out with a population of 870 bacteria, she notices that the population doubles every 22 minutes. Find **a.** the equation for the population  $P$  in terms of time  $t$  in minutes, and **b.** the time it would take for the population to reach 7500 bacteria.



## Section 7.4

Use the properties of logarithms to expand the following expressions as much as possible. Simplify any numerical expressions that can be evaluated without a calculator.

47.  $\log \sqrt{\frac{x^3}{4\pi^5}}$

48.  $\ln \left( \frac{\sqrt{a^5 mn^2}}{e^5} \right)$

49.  $\log_3(27a^3)$

50.  $\ln(\ln(e^{2ex}))$

Use the properties of logarithms to condense the following expressions as much as possible, writing each answer as a single term with a coefficient of 1.

51.  $\frac{1}{3}(\log_2(a^5) - \log_2(bc^3))$

52.  $\ln 4 - \ln(x^2) - 7 \ln y$

53.  $\log_2(x^2 - 9) - \log_2(x + 3)$

54.  $2 \log a + 3 \log b - \frac{1}{2} \log c - \log d$

55.  $\log_3(x - 2) + \log_3 x - \log_3(x^2 + 4)$

Use the properties of logarithms to write each of the following as a single term that does not contain a logarithm.

56.  $6^{3 \log_6 x}$

57.  $5^{\log_5 x - 2 \log_5 y}$

Evaluate the following logarithmic expressions.

58.  $\log_3 17$

59.  $\log_{1.4} 8$

60.  $4 \log_{\frac{1}{2}} 3$

Without using a calculator, evaluate the following expressions.

61.  $\ln \left( \frac{1}{e^2} \right) + \ln e^2$

62.  $\log_4(64^2)$

63. On the Richter scale, the magnitude  $R$  on an earthquake of intensity  $I$  is given by  $R = \log \frac{I}{I_0}$ , where  $I_0 = 1$  is the minimum intensity used for comparison. Find the intensity per unit of area for the following values of  $R$ .

a.  $R = 8.4$

b.  $R = 6.85$

c.  $R = 9.1$

## Section 7.5

Solve the following exponential and logarithmic equations. When appropriate, write the answer as both an exact expression and as a decimal approximation. Round your answer to two decimal places if necessary.

64.  $e^{8-5x} = 16$

65.  $10^{\frac{6}{x}} = 321$

66.  $7^{\frac{x}{3}-4} = 19$

67.  $e^{4x} = 5^{3x+1}$

68.  $24 = 3e^{x+2}$

69.  $3^{2x-1} = 2^{2-x}$

70.  $\ln(x + 1) + \ln(x - 1) = \ln(x + 5)$

71.  $\log_2(x + 3) + \log_2(x + 4) = \log_2(3x + 8)$

72.  $\log_5(8x - 3) = 3$

73.  $\log_7(4x) - \log_7 6 = 2$

74.  $\ln(5x + 8) = \ln(40 - 3x)$

Using the properties of logarithmic functions, simplify the following functions as much as possible. Write each function as a single term with a coefficient of 1, if possible.

75.  $f(x) = 0.75 \ln x^4$

76.  $f(x) = 6 \log \sqrt{2x}$

77.  $f(x) = 4 \log x^3 - \log x^2$

78.  $f(x) = 0.5 \ln(9x^6)$

79.  $f(x) = 2 \log 7^{\log_9 3}$

80.  $f(x) = 2 \ln 3^{\log_4 8}$

81. Rick puts \$6500 in a high interest money market account at 4.36% annual interest compounded monthly. Assuming he makes no deposits or withdrawals, how long will it take for his investment to grow to \$7000?

82. Sodium-24 has a half-life of approximately 15 hours. How long would it take for 350 grams of sodium-24 to decay to 12 grams?