1–12 ■ Sketch the graph of the function. State the domain, range, and asymptote.

1. $f(x) = \dfrac{1}{2^x}$

2. $g(x) = 3^{x-2}$

3. $y = 5 - 10^x$

4. $y = 1 + 5^{-x}$

5. $f(x) = \log_3(x - 1)$

6. $g(x) = \log(-x)$

7. $y = 2 - \log_2 x$

8. $y = 3 + \log_5(x + 4)$

9. $F(x) = e^x - 1$

10. $G(x) = \frac{1}{2}e^{x-1}$

11. $y = 2 \ln x$

12. $y = \ln(x^2)$

13–14 ■ Find the domain of the function.

13. $f(x) = 10^{x^2} + \log(1 - 2x)$

14. $g(x) = \ln(2 + x - x^2)$

15–18 ■ Write the equation in exponential form.

15. $\log_2 1024 = 10$

16. $\log_6 37 = x$

17. $\log x = y$

18. $\ln c = 17$

19–22 ■ Write the equation in logarithmic form.

19. $2^6 = 64$

20. $49^{-1/2} = \frac{1}{7}$

21. $10^x = 74$

22. $e^k = m$

23–38 ■ Evaluate the expression without using a calculator.

23. $\log_2 128$

24. $\log_8 1$

25. $10^{\log 45}$

26. $\log 0.000001$

27. $\ln(e^6)$

28. $\log_4 8$

29. $\log_3\left(\frac{1}{27}\right)$

30. $2^{\log_2 13}$

31. $\log_5 \sqrt{5}$

32. $e^{2 \ln 7}$

33. $\log 25 + \log 4$

34. $\log_3 \sqrt{243}$

35. $\log_2 16^{23}$

36. $\log_5 250 - \log_5 2$

37. $\log_8 6 - \log_8 3 + \log_8 2$

38. $\log \log 10^{100}$

39–44 ■ Rewrite the expression in a form with no logarithms of products, quotients, or powers.

39. $\log(AB^2C^3)$

40. $\log_2\left(x\sqrt{x^2 + 1}\right)$

41. $\ln \sqrt{\dfrac{x^2 - 1}{x^2 + 1}}$

42. $\log\left(\dfrac{4x^3}{y^2(x - 1)^5}\right)$

43. $\log_5\left(\dfrac{x^2(1 - 5x)^{3/2}}{\sqrt{x^3 - x}}\right)$

44. $\ln\left(\dfrac{\sqrt[3]{x^4 + 12}}{(x + 16)\sqrt{x - 3}}\right)$

45–50 ■ Rewrite the expression as a single logarithm.

45. $\log 6 + 4 \log 2$

46. $\log x + \log(x^2y) + 3 \log y$

47. $\frac{3}{2}\log_2(x - y) - 2 \log_2(x^2 + y^2)$

48. $\log_5 2 + \log_5(x + 1) - \frac{1}{3}\log_5(3x + 7)$

49. $\log(x - 2) + \log(x + 2) - \frac{1}{2}\log(x^2 + 4)$

50. $\frac{1}{2}[\ln(x - 4) + 5 \ln(x^2 + 4x)]$

51–60 ■ Use a calculator to find the solution of the equation, correct to two decimal places.

51. $\log_2(1 - x) = 4$

52. $2^{3x-5} = 7$

53. $5^{5-3x} = 26$

54. $\ln(2x - 3) = 14$

55. $e^{3x/4} = 10$

56. $2^{1-x} = 3^{2x+5}$

57. $\log x + \log(x + 1) = \log 12$

58. $\log_8(x + 5) - \log_8(x - 2) = 1$

59. $x^2e^{2x} + 2xe^{2x} = 8e^{2x}$

60. $2^{3^x} = 5$

61–64 ■ Use a calculator to find the solution of the equation, correct to six decimal places.

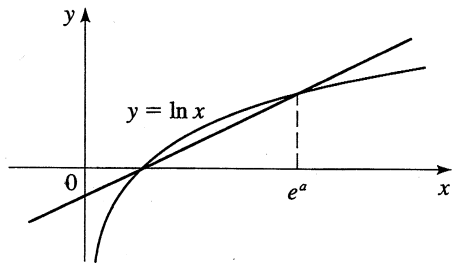
61. $5^{-2x/3} = 0.63$

62. $2^{3x-5} = 7$

63. $5^{2x+1} = 3^{4x-1}$

64. $e^{-15k} = 10{,}000$

74. Find an equation of the line shown in the figure.



75. Evaluate $\log_4 15$, correct to six decimal places.

76. Solve the inequality: $0.2 \leqslant \log x < 2$

77. Which is larger, $\log_4 258$ or $\log_5 620$?

78. Find the inverse of the function $f(x) = 2^{3^x}$ and state its domain and range.

87. The graph shows the population of a rare species of bird, where t represents years since 1994 and $n(t)$ is measured in thousands.

(a) Find a function that models the bird population at time t in the form $n(t) = n_0e^{rt}$.

(b) What is the bird population expected to be in the year 2005?