

17. (a) $\log_6 36$ (b) $\log_9 81$ (c) $\log_7 7^{10}$
 18. (a) $\log_2 32$ (b) $\log_8 8^{17}$ (c) $\log_6 1$
 19. (a) $\log_3(\frac{1}{27})$ (b) $\log_{10} \sqrt{10}$ (c) $\log_5 0.2$
 20. (a) $\log_5 125$ (b) $\log_{49} 7$ (c) $\log_9 \sqrt{3}$
 21. (a) $2^{\log_2 37}$ (b) $3^{\log_3 8}$ (c) $e^{\ln \sqrt{5}}$
 22. (a) $e^{\ln \pi}$ (b) $10^{\log 5}$ (c) $10^{\log 87}$
 23. (a) $\log_8 0.25$ (b) $\ln e^4$ (c) $\ln(1/e)$
 24. (a) $\log_4 \sqrt{2}$ (b) $\log_4(\frac{1}{2})$ (c) $\log_4 8$

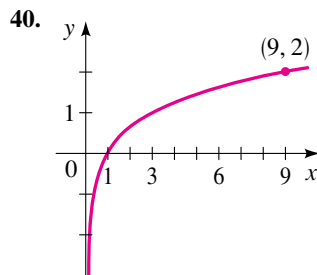
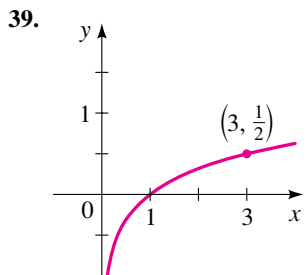
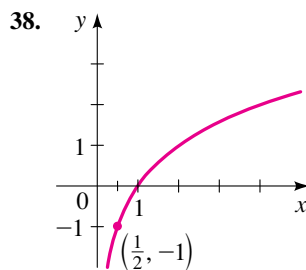
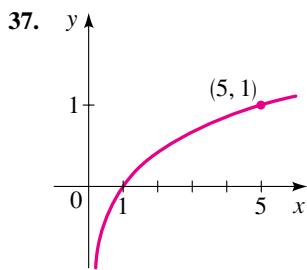
25–32 ■ Use the definition of the logarithmic function to find x .

25. (a) $\log_2 x = 5$ (b) $\log_2 16 = x$
 26. (a) $\log_5 x = 4$ (b) $\log_{10} 0.1 = x$
 27. (a) $\log_3 243 = x$ (b) $\log_3 x = 3$
 28. (a) $\log_4 2 = x$ (b) $\log_4 x = 2$
 29. (a) $\log_{10} x = 2$ (b) $\log_5 x = 2$
 30. (a) $\log_x 1000 = 3$ (b) $\log_x 25 = 3$
 31. (a) $\log_x 16 = 4$ (b) $\log_x 8 = \frac{3}{2}$
 32. (a) $\log_x 6 = \frac{1}{2}$ (b) $\log_x 3 = \frac{1}{3}$

33–36 ■ Use a calculator to evaluate the expression, correct to four decimal places.

33. (a) $\log 2$ (b) $\log 35.2$ (c) $\log(\frac{2}{3})$
 34. (a) $\log 50$ (b) $\log \sqrt{2}$ (c) $\log(3\sqrt{2})$
 35. (a) $\ln 5$ (b) $\ln 25.3$ (c) $\ln(1 + \sqrt{3})$
 36. (a) $\ln 27$ (b) $\ln 7.39$ (c) $\ln 54.6$

37–40 ■ Find the function of the form $y = \log_a x$ whose graph is given.



41–46 ■ Match the logarithmic function with one of the graphs labeled I–VI.

41. $f(x) = -\ln x$

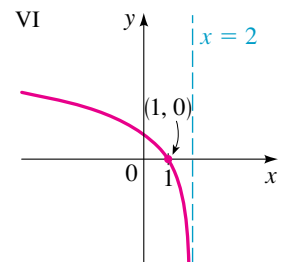
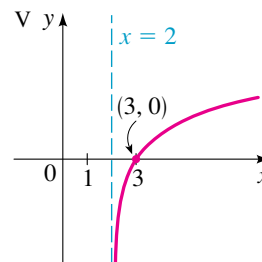
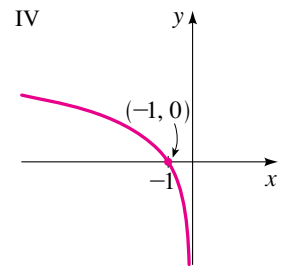
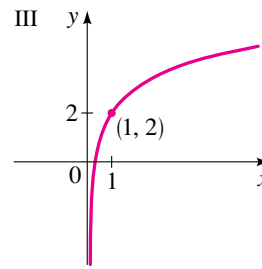
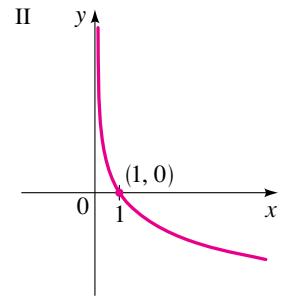
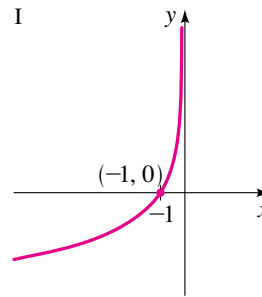
42. $f(x) = \ln(x - 2)$

43. $f(x) = 2 + \ln x$

44. $f(x) = \ln(-x)$

45. $f(x) = \ln(2 - x)$

46. $f(x) = -\ln(-x)$



47. Draw the graph of $y = 4^x$, then use it to draw the graph of $y = \log_4 x$.

48. Draw the graph of $y = 3^x$, then use it to draw the graph of $y = \log_3 x$.

49–58 ■ Graph the function, not by plotting points, but by starting from the graphs in Figures 4 and 9. State the domain, range, and asymptote.

49. $f(x) = \log_2(x - 4)$

50. $f(x) = -\log_{10} x$

51. $g(x) = \log_5(-x)$

52. $g(x) = \ln(x + 2)$

53. $y = 2 + \log_3 x$

54. $y = \log_3(x - 1) - 2$

55. $y = 1 - \log_{10} x$

56. $y = 1 + \ln(-x)$

57. $y = |\ln x|$

58. $y = \ln |x|$