

Use the definition of a logarithm to write the given equation in logarithmic form.

1. $5^3 = 125$ $\log_5 125 = 3$

3. $6^{-2} = \frac{1}{36}$ $\log_6 \frac{1}{36} = -2$

5. $e^3 = 20.085$ $\ln 20.085 = 3$

7. $e^x = 4$ $\ln 4 = x$

9. $8^2 = 64$ $\log_8 64 = 2$

2. $81^{1/4} = 3$ $\log_{81} 3 = 1/4$

4. $10^{-3} = 0.001$ $\log 0.001 = -3$

6. $e^0 = 1$ $\ln 1 = 0$

8. $u^v = w$ $\log_u w = v$

10. $9^{3/2} = 27$ $\log_9 27 = 3/2$

Use the definition of a logarithm to write the given equation in exponential form.

11. $\log_2 8 = x$ $2^x = 8$

13. $\log_5 625 = 4$ $5^4 = 625$

15. $\log_x 13 = 5$ $x^5 = 13$

17. $\log_2 \frac{1}{8} = -3$ $2^{-3} = \frac{1}{8}$

19. $\log_4 64 = 3$ $4^3 = 64$

12. $\ln 143 = x$ $e^x = 143$

14. $\log 1000 = 3$ $10^3 = 1000$

16. $\ln x = 14$ $e^{14} = x$

18. $\log \frac{1}{100} = -2$ $10^{-2} = \frac{1}{100}$

20. $\ln 18 = x$ $e^x = 18$

Use your calculator to evaluate. Round to four decimal places.

21. $\log 68$ 1.8325

23. $\log 100$ 2

25. $\ln 9$ 2.1972

27. $\log 10$ 1

29. $\ln 216$ 5.3753

22. $\ln 9548$ 9.1641

24. $\log 0.0001$ -4

26. $\log 17$ 1.2304

28. $\ln 125$ 4.8283

30. $\log 6158$ 3.7894

$\log(3)$

Use the change of base formula to evaluate. Round to four decimal places.

31. $\log_3 7$ 1.7712

33. $\log_9 0.04$ -1.465

35. $\log_7 4$.7124

37. $\log_{20} 125$ 1.6117

39. $\log_6 95$ 2.5416

32. $\log_{0.5} 4$ -2

34. $\log_{15} 1250$ 2.6332

36. $\log_4 0.55$ -.4312

38. $\log_{\frac{1}{3}} 0.015$ 3.8227

40. $\log_{17} 2$.2447

Use the properties of logarithms to expand the following.

$$41. \log_2 5x \quad \underline{\log_2(5) + \log_2(x)}$$

$$43. \log_3 \frac{5}{3} \quad \underline{\frac{\log_3(5) - \log_3(3)}{\log_3(5) - 1}}$$

$$45. \ln z(z-1)^2 \quad \underline{\frac{\ln(z) + \ln(z-1)^2}{\ln(z) + 2 \cdot \ln(z-1)}}$$

$$47. \log \left(\frac{x^2-1}{x^3} \right)^3 \quad \underline{3 \cdot \log(x-1) + 3 \cdot \log(x+1) - 9 \cdot \log(x)}$$

$$49. \ln \frac{x}{\sqrt{x^2+1}} \quad \underline{\ln(x) - \frac{1}{2} \cdot \ln(x^2+1)}$$

$$\frac{3(x+1)^3}{9}$$

$$42. \log_5 x^4 \quad \underline{4 \log_5(x)}$$

$$44. \ln \sqrt{z} \quad \underline{\frac{1}{2} \cdot \ln(z)}$$

$$46. \log_7 \frac{x^2}{y^2 z^3} \quad \underline{2 \cdot \log_7(x) - 2 \cdot \log_7(y)}$$

$$48. \log_x \frac{\sqrt{a} y^4}{z^4} \quad \underline{\log_x(a^{1/2}) + \log_x(y^4) - \frac{1}{2} \cdot \log_x(a) + 4 \cdot \log_x(y) -}$$

$$50. \log(x^2 - 8x + 15) \quad \underline{\log(x-5) + \log(x-3)}$$

$$\log_7(x^2) - (\log_7(x^2) + \log_7(z^3))$$

Use the properties of logarithms to write the following as a single logarithm.

51. $\ln x + \ln 2$ $\ln x \cdot 2 = \ln(2x)$

53. $2 \log_2 (x+4)$ $\log_2 (x+4)^2$

55. $\log_3 (x-2) - \log_3 (x+2)$ $\log_3 \left(\frac{x-2}{x+2}\right)$

57. $3 \ln x + 2 \ln y - 4 \ln z$ $\ln \frac{x^3 y^2}{z^4}$

59. $\ln x - 2 [\ln(x+2) + \ln(x-2)]$ $\ln \frac{x}{(x-2)(x+2)^2}$

$\ln \frac{x}{(x^2-4)^2}$

52. $\log_4 z - \log_4 y$ $\log_4 \left(\frac{z}{y}\right)$

54. $\frac{1}{3} \log_3 5x$ $\log_3 (5x)^{1/3} = \log_3 \sqrt[3]{5x}$

56. $2 \ln 8 + 5 \ln z$ $\ln 8^2 \cdot z^5$

58. $4 [\ln z + \ln(z+5)] - 2 \ln(z-5)$ $\ln \frac{(z(z+5))^4}{(z-5)^2}$

60. $\frac{3}{2} \log_4 5t^6 - \frac{3}{4} \log_4 t^4$ $\log_4 \frac{(5t^6)^{3/2}}{(t^4)^{3/4}}$

$\log_4 \frac{\sqrt{(5t^6)}}{\sqrt[4]{(t^4)^3}}$

Given $\log_x 2 = 0.3562$, $\log_x 3 = 0.5646$, and $\log_x 5 = 0.8271$, Evaluate.

61. $\log_x 6$ _____

62. $\log_x \frac{1}{4}$ _____

63. $\log_x \frac{3}{2}$ _____

64. $\log_x 15$ _____

65. $\log_x 25$ _____

66. $\log_x \frac{5}{3}$ _____

67. $\log_x \sqrt{2}$ _____

68. $\log_x 18$ _____

69. $\log_x 40$ _____

70. $\log_x 30$ _____