

Evaluate the expression.

1. $\log_2(4 \cdot 6)$

4.6

2. $\log_2 4^3$

6

3. $\log 8$

0.9

4. $\ln 4.6$

1.5

5. $\log \frac{1}{3}$

-.48

6. $\log_{16} 81$

1.6

Expand the expression.

7. $\ln 22x$

$\ln 22 + \ln X$

8. $\log_6 x^6$

$6 \log_6 X$

9. $\log_3 25$

$\log_3 5 + \log_3 5$

10. $\ln 3xy^3$

$\ln 3 + \ln X + 3 \ln Y$

11. $\log_8 64x^2$

$\log_8 64 = 2 \log_8 X$

12. $\ln x^{\frac{1}{2}}y^3$

$\frac{1}{2} \ln X + 3 \ln Y$

13. $\ln \frac{3y^4}{x^3}$

$\ln 3 + 4 \ln Y - 3 \ln X$

14. $\log_6 \frac{10}{3}$

$\log_6 10 - \log_6 3$

Condense the expression.

15. $\ln 16 - \ln 4$

$\ln \frac{16}{4}$ or $\ln 4$

16. $4 \log_{16} 12 - 4 \log_{16} 2$

$\log_{16} \frac{12^4}{2^4}$

17. $7 \log_4 2 + 5 \log_4 x + 3 \log_4 y$

$\log_4 2^7 x^5 y^3$

18. $\log_3 2 + \frac{1}{2} \log_3 y$

$\log_3 2\sqrt{y}$ or $\log_3 2y^{\frac{1}{2}}$

19. $\log_5 8 - \log_5 12$

$\log_5 \frac{8}{12}$ or $\log_5 \frac{2}{3}$

20. $\ln 20 + 2 \ln \frac{1}{2} + \ln x$

$\ln 20 \left(\frac{1}{2}\right)^2 X$

21. $10 \log x + 2 \log 10$

$$\log x^{10} 10^2$$

22. $2 \log x + \log 5$

$$\log 5x^2$$

Rewrite the equation in exponential form.

23. $\log_5 \frac{1}{5} = -1$

$$5^{-1} = \frac{1}{5}$$

24. $\log_8 512 = 3$

$$8^3 = 512$$

25. $\log_{14} 196 = 2$

$$14^2 = 196$$

26. $\log_{105} 11,025 = 2$

$$105^2 = 11,025$$

Solve the exponential equation.

27. $25^{x-1} = 125^{4x}$

$$x = -\frac{1}{5}$$

28. $36^{x-9} = 6^{2x}$

undefined

29. $e^{-x} = 6$

$$x = -1.79$$

30. $10^{2x} + 3 = 8$

$$x = 0.35$$

31. $0.25^x - 0.5 = 2$

$$x = -.66$$

32. $10^{-12x} + 6 = 100$

$$x = -0.16$$

33. $3^{0.1x} - 4 = 5$

$$x = 20$$

34. $-16 + 0.2(10)^x = 35$

$$x = 2.4$$

Solve the logarithmic equation.

35. $\ln(4x + 1) = \ln(2x + 5)$

$$x = 2$$

36. $\log_2 x = -1$

$$x = \frac{1}{2}$$

37. $16 \ln x = 30$

$$x = 6.5$$

38. $1 - 2 \ln x = -4$

$$x = 12.2$$

39. $\log_5(2x + 15) = \log_5 3x$

$$x = 15$$

40. $\ln x + \ln(x + 3) = 1$

$$x = -3.73$$

41. $15 + 2 \log_2 x = 31$

$$x = 256$$

42. $\log(5 - 3x) = \log(4x - 9)$

$$x = 2$$

43. You invest \$500 into an account earning 6% interest compounded monthly. How long will it be until the balance is double? $A = P \left(1 + \frac{r}{n}\right)^{nt}$

$$t = 11.58$$

44. You buy a new computer for \$2100. The computer decreases by 50% annually. When will the computer have a value of \$600? $y = a(1 - r)^t$

$$t = 1.786$$

45. You drink a beverage with 120 mg of caffeine. Each hour, the caffeine in your system decreases by about 12%. How long until you have 10mg of caffeine? $y = a(1 - r)^t$

$$t = 19.4$$

46. The foundation of your house has about 1,200 termites. The termites grow at a rate of about 2.4% per day. How long until the number of termites doubles? $y = a(1 + r)^t$

$$t = 29.2$$