

Evaluate each expression.

10. $\log_2 \frac{1}{16}$

11. $\log_{10} 0.01$

12. $\log_7 \frac{1}{343}$

Solve each equation.

13. $\log_2 x = 5$

14. $\log_7 n = \frac{2}{3} \log_7 8$

15. $\log_6 (4x + 4) = \log_6 64$

16. $2 \log_6 4 - \frac{1}{4} \log_6 16 = \log_6 x$

Graph each equation or inequality.

17. $y = \log_{\frac{1}{2}} x$

18. $y \geq \log_6 x$

19. **Biology** The generation time for bacteria is the time that it takes for the population to double. The generation time G can be found using experimental data and the formula $G = \frac{t}{3.3 \log_b \frac{f}{b}}$ where t is the time period, b is the number of bacteria at the beginning of the experiment, and f is the number of bacteria at the end of the experiment. The generation time for mycobacterium tuberculosis is 16 hours. How long will it take four of these bacteria to multiply into 1024 bacteria?

EXERCISES

Write each equation in exponential form.

20. $\log_{27} 3 = \frac{1}{3}$

21. $\log_{16} 4 = \frac{1}{2}$

22. $\log_7 \frac{1}{2401} = -4$

23. $\log_4 32 = \frac{5}{2}$

24. $\log_e 65.98 = x$

25. $\log \sqrt{6} 36 = 4$

Write each equation in logarithmic form.

26. $81^{\frac{1}{2}} = 9$

27. $36^{\frac{3}{2}} = 216$

28. $\left(\frac{1}{8}\right)^{-3} = 512$

29. $6^{-2} = \frac{1}{36}$

30. $16^0 = 1$

31. $x^{1.238} = 14.36$

Evaluate each expression.

32. $\log_8 64$

33. $\log_{125} 5$

34. $\log_2 32$

35. $\log_4 128$

36. $\log_9 9^6$

37. $\log_{49} 343$

38. $\log_8 16$

39. $\log_{\sqrt{8}} 4096$

40. $10^{4 \log_{10} 2}$

Solve each equation.

41. $\log_x 49 = 2$

42. $\log_3 3x = \log_3 36$

43. $\log_6 x + \log_6 9 = \log_6 54$

44. $\log_8 48 - \log_8 w = \log_8 6$

45. $\log_6 216 = x$

46. $\log_5 0.04 = x$

47. $\log_{10} \sqrt[3]{10} = x$

48. $\log_{12} x = \frac{1}{2} \log_{12} 9 + \frac{1}{3} \log_{12} 27$

49. $\log_5 (x + 4) + \log_5 8 = \log_5 64$

50. $\log_4 (x - 3) + \log_4 (x + 3) = 2$

51. $\frac{1}{2} (\log_7 x + \log_7 8) = \log_7 16$

52. $2 \log_5 (x - 2) = \log_5 36$