

3-2 Homework

Logarithms and Logarithmic Functions

Write each equation in logarithmic form.

1. $5^3 = 125$ $\log_5 125 = 3$ 2. $7^0 = 1$ $\log_7 1 = 0$ 3. $3^4 = 81$ $\log_3 81 = 4$
 4. $3^{-4} = \frac{1}{81}$ $\log_3 \frac{1}{81} = -4$ 5. $(\frac{1}{4})^3 = \frac{1}{64}$ $\log_{\frac{1}{4}} \frac{1}{64} = 3$ 6. $7776^{\frac{1}{5}} = 6$ $\log_{7776} 6 = \frac{1}{5}$

Write each equation in exponential form.

7. $\log_6 216 = 3$ $6^3 = 216$ 8. $\log_2 64 = 6$ $2^6 = 64$ 9. $\log_3 \frac{1}{81} = -4$ $3^{-4} = \frac{1}{81}$
 10. $\log_{10} 0.00001 = -5$ $10^{-5} = 0.00001$ 11. $\log_{25} 5 = \frac{1}{2}$ $25^{\frac{1}{2}} = 5$ 12. $\log_{32} 8 = \frac{3}{5}$ $32^{\frac{3}{5}} = 8$

Evaluate each expression.

13. $\log_3 81$ $\frac{\log 81}{\log 3} = 4$ 14. $\log_{10} 0.0001 = -4$ 15. $\log_2 \frac{1}{16} = -4$ 16. $\log_3 27 = 3$
 17. $\log_9 1 = 0$ 18. $\log_8 4 = \frac{2}{3}$ 19. $\log_7 \frac{1}{49} = -2$ 20. $\log_6 6^4 = 4$
 21. $\log_3 \frac{1}{3} = -1$ 22. $\log_4 \frac{1}{256} = -4$ *23. $\log_9 9^{(n+1)} = n+1$ *24. $2^{\log_2 32} = 32$

Solve each equation or inequality. Check your solutions.

25. $\log_{10} n = -3$ $10^{-3} = n$ $n = 0.001$ 26. $\log_4 x > 3$ $x > 4^3 = 64$ 27. $\log_4 x = \frac{3}{2}$ $4^{\frac{3}{2}} = x$ $x = 8$
 28. $\log_5 x = -3$ $\frac{1}{5^{-3}} = x$ $x = 125$ *29. $\log_7 q < 0$ $0 < q < 7$ 30. $\log_6 (2y + 8) \geq 2$ $2y + 8 \geq 6^2 = 36$ $2y \geq 28$ $y \geq 14$
 31. $\log_y 16 = -4$ $y^{-4} = 16$ $y = \frac{1}{2}$ 32. $\log_{\frac{1}{8}} \frac{1}{8} = -3$ $n = \frac{1}{8}$ $n = 2$ 33. $\log_b 1024 = 5$ $b^5 = 1024$ $b = 4$
 34. $\log_8 (3x + 7) < \log_8 (7x + 4)$ $3x + 7 < 7x + 4$ $3 < 4x$ $x > \frac{3}{4}$ 35. $\log_7 (8x + 20) = \log_7 (x + 6)$ $8x + 20 = x + 6$ $7x = -14$ $x = -2$ 36. $\log_3 (x^2 - 2) = \log_3 x$ $x^2 - 2 = x$ $x^2 - x - 2 = 0$ $(x-2)(x+1) = 0$ $x = 2$ $x = -1$

*37. **SOUND** Sounds that reach levels of 130 decibels or more are painful to humans. What is the relative intensity of 130 decibels?
 $L = 10 \log_{10} R$ $130 = 10 \log_{10} R$

38. **INVESTING** Maria invests \$1000 in a savings account that pays 8% interest compounded annually. The value of the account A at the end of five years can be determined from the equation $\log A = \log[1000(1 + 0.08)^5]$. Find the value of A to the nearest dollar.

\$ 1469.00

$13 = \log_{10} R$
 $10^{13} = R$