

Practice 8-3

Logarithmic Functions as Inverses

Write each equation in exponential form.

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|------------------------------------|---|---|--|
| 1. $\log_4 256 = 4$
$4^4 = 256$ | 2. $\log_7 1 = 0$
$7^0 = 1$ | 3. $\log_2 32 = 5$
$2^5 = 32$ | 4. $\log 10 = 1$
$10^1 = 10$ |
| 5. $\log_5 5 = 1$
$5^1 = 5$ | 6. $\log_8 \frac{1}{64} = -2$
$8^{-2} = \frac{1}{64}$ | 7. $\log_9 59,049 = 5$
$9^5 = 59,049$ | 8. $\log_{17} 289 = 2$
$17^2 = 289$ |
| 9. $\log_{56} 1 = 0$
$56^0 = 1$ | 10. $\log_{12} \frac{1}{144} = -2$
$12^{-2} = \frac{1}{144}$ | 11. $\log_2 \frac{1}{1024} = -10$
$2^{-10} = \frac{1}{1024}$ | 12. $\log_3 6561 = 8$
$3^8 = 6561$ |

Write each equation in logarithmic form.

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|---|---|---|---|
| 13. $9^2 = 81$
$\log_9 81 = 2$ | 14. $25^2 = 625$
$\log_{25} 625 = 2$ | 15. $8^3 = 512$
$\log_8 512 = 3$ | 16. $13^2 = 169$
$\log_{13} 169 = 2$ |
| 17. $2^9 = 512$
$\log_2 512 = 9$ | 18. $4^5 = 1024$
$\log_4 1024 = 5$ | 19. $5^4 = 625$
$\log_5 625 = 4$ | 20. $10^{-3} = 0.001$
$\log_{10} 0.001 = -3$ |
| 21. $4^{-3} = \frac{1}{64}$
$\log_4 \frac{1}{64} = -3$ | 22. $5^{-2} = \frac{1}{25}$
$\log_5 \frac{1}{25} = -2$ | 23. $8^{-1} = \frac{1}{8}$
$\log_8 \frac{1}{8} = -1$ | 24. $11^0 = 1$
$\log_{11} 1 = 0$ |
| 25. $6^1 = 6$
$\log_6 6 = 1$ | 26. $6^{\frac{1}{3}} = \sqrt[3]{6}$
$\log_6 \sqrt[3]{6} = \frac{1}{3}$ | 27. $17^0 = 1$
$\log_{17} 1 = 0$ | 28. $17^1 = 17$
$\log_{17} 17 = 1$ |

29. A single-celled bacterium divides every hour. The number N of bacteria after t hours is given by the formula $\log_2 N = t$. After how many hours will there be 32 bacteria?
 5 hours

Evaluate each logarithm.

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|----------------------------------|----------------------------------|-----------------------------------|------------------------------------|
| 30. $\log_2 16$
4 | 31. $\log_2 8$
3 | 32. $\log_2 4$
2 | 33. $\log_2 2$
1 |
| 34. $\log_2 1$
0 | 35. $\log_2 \frac{1}{2}$
-1 | 36. $\log_2 \frac{1}{4}$
-2 | 37. $\log_2 \frac{1}{8}$
-3 |
| 38. $\log_{16} 16$
1 | 39. $\log_5 125$
3 | 40. $\log_{11} 121$
2 | 41. $\log 0.1$
-1 |
| 42. $\log 1$
0 | 43. $\log_3 1$
0 | 44. $\log_6 216$
3 | 45. $\log_{12} 12$
1 |
| 46. $\log_{30} 30$
1 | 47. $\log 100,000$
5 | 48. $\log_3 \frac{1}{9}$
-2 | 49. $\log_3 \frac{1}{27}$
-3 |
| 50. $\log \frac{1}{100}$
-2 | 51. $\log_4 32$
$\frac{5}{2}$ | 52. $\log_7 \frac{1}{49}$
-2 | 53. $\log_{81} 9$
$\frac{1}{2}$ |

For each pH given, find the concentration of hydrogen ions $[H^+]$. Use the formula $pH = -\log[H^+]$.

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|---------------------|---------------------|---------------------|---------------------|
| 54. 7.2 $10^{-7.2}$ | 55. 7.3 $10^{-7.3}$ | 56. 8.2 $10^{-8.2}$ | 57. 6.2 $10^{-6.2}$ |
| 58. 5.6 $10^{-5.6}$ | 59. 4.6 $10^{-4.6}$ | 60. 7.0 10^{-7} | 61. 2.9 $10^{-2.9}$ |

Graph each logarithmic function.

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| 62. $y = \log x$
$10^x = y$ | 63. $y = \log_3 x$
$3^x = y$ | 64. $y = \log_6 x$
$6^x = y$ |
| 65. $y = \log_{\frac{1}{2}} x$
$\frac{1}{2}^x = y$ | 66. $y = \log_3(x + 1)$
$3^{x-1} = y$ | 67. $y = \log_2 x - 3$
$2^{x+3} = y$ |
| 68. $y = \log_6(x + 2)$
$6^{x-2} = y$ | 69. $y = \log_5(x - 4) + 1$
$5^{x-1} + 4 = y$ | 70. $y = \log_2(x - 3) + 1$
$2^{x-1} + 3 = y$ |