

Practice 8-3

Logarithmic Functions as Inverses

Write each equation in exponential form.

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

Write each equation in logarithmic form.

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|-----------------------------|------------------------------|----------------------------|-----------------------|
| 13. $9^2 = 81$ | 14. $25^2 = 625$ | 15. $8^3 = 512$ | 16. $13^2 = 169$ |
| 17. $2^9 = 512$ | 18. $4^5 = 1024$ | 19. $5^4 = 625$ | 20. $10^{-3} = 0.001$ |
| 21. $4^{-3} = \frac{1}{64}$ | 22. $5^{-2} = \frac{1}{25}$ | 23. $8^{-1} = \frac{1}{8}$ | 24. $11^0 = 1$ |
| 25. $6^1 = 6$ | 26. $6^{-3} = \frac{1}{216}$ | 27. $17^0 = 1$ | 28. $17^1 = 17$ |

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?

Evaluate each logarithm.

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

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

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| 54. 7.2 | 55. 7.3 | 56. 8.2 | 57. 6.2 |
| 58. 5.6 | 59. 4.6 | 60. 7.0 | 61. 2.9 |

Graph each logarithmic function.

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