

15.6 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. Base _____ logarithms are called common logarithms.
2. Base _____ logarithms are called natural logarithms.
3. The logarithm with base greater than 1 of any number between 0 and 1 will always be _____.
4. Finding the value of the related exponential expression is called finding the _____ of the logarithm.
5. The notation for natural logarithms is shortened to _____.
6. The logarithm of a negative number is _____.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. Whenever the base of a logarithm is omitted, it is understood to be 1.
8. Logarithms of negative numbers or 0 do not exist.
9. Common logarithms have an inverse while natural logarithms do not.
10. Given $\log x = 4$, the inverse log of 4 is $x = 10^4 = 10,000$.


Practice

Express each equation in logarithmic form. See Examples 1 and 4.


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| 1. $10^{1.5} = x$ | 6. $e^k = 12.4$ |
| 2. $10^k = 23$ | 7. $e^0 = 1$ |
| 3. $10^{-3} = \frac{1}{1000}$ | 8. $e^4 = x$ |
| 4. $10^{-4} = 0.0001$ | 9. $10^x = 3.2$ |
| 5. $e^x = 27$ | 10. $10^y = x$ |

Express each equation in exponential form. See Examples 1 and 4.

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| 11. $\log 1 = 0$ | 16. $\log x = 25.3$ |
| 12. $\log 100 = 2$ | 17. $\ln e = 1$ |
| 13. $\log 5.4 = y$ | 18. $\log 10 = 1$ |
| 14. $\ln 40.1 = x$ | 19. $\ln x = a$ |
| 15. $\ln x = 1.54$ | 20. $\log a = x$ |

 Use a calculator to evaluate the logarithms accurate to the nearest ten-thousandths place. See Examples 2 and 5.

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| 21. $\log 173$ | 27. $\ln 37.5$ |
| 22. $\log 396$ | 28. $\ln 96$ |
| 23. $\log 88.4$ | 29. $\ln(-14.9)$ |
| 24. $\log 0.0061$ | 30. $\ln 157.6$ |
| 25. $\log 0.0573$ | 31. $\ln 0.00461$ |
| 26. $\log(-8.47)$ | 32. $\ln 0.0139$ |

 Use a calculator to find the value of x in each equation accurate to the nearest ten-thousandths place. See Examples 3 and 6.

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| 33. $\log x = 2.31$ | 39. $\ln x = 5.17$ |
| 34. $\log x = -3$ | 40. $\ln x = 4.9$ |
| 35. $\log x = -1.7$ | 41. $\ln x = -8.3$ |
| 36. $\log x = 4.1$ | 42. $\ln x = 6.74$ |
| 37. $2 \log x = -0.038$ | 43. $0.2 \ln x = 0.0079$ |
| 38. $5 \log x = 9.4$ | 44. $3 \ln x = -0.066$ |

Writing & Thinking

45. Explain the difference in the meaning of the expressions $\log x$ and $\ln x$.
46. The function $y = \log x$ is defined only for $x > 0$. Discuss the function $y = \log(-x)$. That is, does this function even exist? If it does exist, what is its domain? Sketch its graph and the graph of the function $y = \log x$.
47. What is the domain of the function $y = \ln|x|$? Graph the function.