17.6 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.

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

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

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

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

21. $\log 173$

22. $\log 396$

23. $\log 88.4$

24. $\log 0.0061$

25. $\log 0.0573$

26. $\log(-8.47)$

27. $\ln 37.5$

28. $\ln 96$

29. $\ln(-14.9)$

30. $\ln 157.6$

31. $\ln 0.00461$

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.

33. $\log x = 2.31$

34. $\log x = -3$

35. $\log x = -1.7$

36. $\log x = 4.1$

37. $2 \log x = -0.038$

38. $5 \log x = 9.4$

39. $\ln x = 5.17$

40. $\ln x = 4.9$

41. $\ln x = -8.3$

42. $\ln x = 6.74$

43. $0.2 \ln x = 0.0079$

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.

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