2. Try to find log (-7) on a calculator. What happens? Why?

3. Suppose you are told that log $8 \approx 0.9031$. Find each of the following without using a calculator. Then check your answers with a calculator.

   a. log 80   b. log 800   c. log 80,000   d. log 0.8   e. log 0.08

4. a. The statement $\log_2 16 = 4$ means that $16 = \underline{\ ?\ }$.
   b. The statement log $31 \approx 1.49$ means that $31 \approx \underline{\ ?\ }$.
   c. The statement log $61 \approx 1.79$ means that $61 \approx \underline{\ ?\ }$.

5. Find each logarithm without using a calculator.

   a. $\log_7 49$ b. $\log_2 16$ c. $\log_2 \frac{1}{8}$ d. $\log_5 \frac{1}{5}$ e. $\log_5 \sqrt{5}$

6. Use a calculator to approximate each logarithm to four decimal places.

   a. ln 2   b. ln 3   c. ln 2.7   d. ln 2.8   e. ln e

7. Find the value of x to the nearest hundredth: (a) $10^x = 50$ (b) $e^x = 50$

Solve each equation. (Do not use a calculator.)

8. a. $\log_5 x = 2$ b. $\log_6 x = 2$ c. $\log x = 2$ d. $\ln x = 2$

9. a. $\log_x 121 = 2$ b. $\log_x 64 = 3$ c. $\log_x \left(\frac{1}{2}\right) = -1$ d. $\log_x \sqrt{6} = \frac{1}{2}$

WRITTEN EXERCISES

Write each equation in exponential form.

A   1. $\log_4 16 = 2$ 2. $\log_4 64 = 3$ 3. $\log_6 \left(\frac{1}{36}\right) = -2$ 4. $\log_4 8 = 1.5$

5. log $1000 = 3$ 6. log $40 \approx 1.6$ 7. ln $8 \approx 2.1$ 8. ln $0.2 \approx -1.6$

9. a. What does it mean to say that x is the common logarithm of N?
   b. Solve (1) $10^x = 7$ and (2) $10^x = 0.562$ for x to the nearest hundredth.
   c. What does it mean to say that x is the natural logarithm of N?
   d. Solve (1) $e^x = 12$ and (2) $e^x = 0.06$ for x to the nearest hundredth.

10. Find the value of x to the nearest hundredth: (a) $10^x = 170$ (b) $e^x = 500$

Find each logarithm. (Do not use a calculator.)

11. a. log 100   b. log 10,000   c. log 0.01   d. log 0.0001

12. a. $\log_2 4$ b. $\log_2 32$ c. $\log_2 64$ d. $\log_2 2^{10}$

13. a. $\log_3 9$ b. $\log_3 27$ c. $\log_3 243$ d. $\log_3 3^8$

14. a. $\log_5 0.2$ b. $\log_5 \frac{1}{125}$ c. $\log_5 \sqrt[3]{5}$ d. $\log_5 1$

15. **a.** $\log_4 64$ **b.** $\log_4 \dfrac{1}{64}$ **c.** $\log_4 \sqrt[4]{4}$ **d.** $\log_4 1$

16. **a.** $\log_6 36$ **b.** $\log_{36} 6$ **c.** $\log_6 6\sqrt{6}$ **d.** $\log_6 \sqrt[3]{\dfrac{1}{6}}$

17. **a.** $\ln e$ **b.** $\ln e^2$ **c.** $\ln \dfrac{1}{e}$ **d.** $\ln \sqrt{e}$

18. **a.** $\log 10^8$ **b.** $\log_2 2^8$ **c.** $\log_5 5^8$ **d.** $\ln e^8$

19. Given $\log 4.17 \approx 0.6201$, find: **a.** $\log 417$ **b.** $\log 0.417$ **c.** $\log 0.0417$

20. Given $\log 6.92 \approx 0.8401$, find: **a.** $\log 692$ **b.** $\log 0.692$ **c.** $\log 0.00692$

21. Given $\ln 10 \approx 2.3026$, find: **a.** $\ln 0.1$ **b.** $\ln 0.01$ **c.** $\ln 100$

22. Given $\ln 5 \approx 1.6094$, find: **a.** $\ln 0.2$ **b.** $\ln 25$ **c.** $\ln 0.04$

B 23. **Physics** Find the decibel level for each sound with the given intensity I.
   a. Average car at 70 km/h, $I = 10^{6.8} I_0$ **b.** Whisper, $I = 10^{1.5} I_0$

24. **Physics** Find the decibel level for each sound with the given intensity I.
   a. Softly played flute, $I = 10^{4.1} I_0$ **b.** Vacuum cleaner, $I = 10^{7.5} I_0$

25. **a.** **Physics** Find the decibel level of two stereos, playing the same music simultaneously at 62 dB.
   b. Find the decibel level if three stereos play instead of two.

26. **Physics** If the decibel level of one car accelerating from rest to 50 km/h is 80 dB, what is the decibel level of four similar cars accelerating simultaneously?

27. **a.** On a single set of axes, graph $f(x) = 2^x$ and $f^{-1}(x) = \log_2 x$.
   b. Give the domain and range of each function.

28. **a.** Find $2^{\log_2 8}$, $5^{\log_5 25}$, and $3^{\log_3 x}$.
   b. If $f(x) = 3^x$, what is $f^{-1}(x)$? What is $(f \circ f^{-1})(x)$?

29. **a.** If $f(x) = e^x$, what is $f^{-1}(x)$?
   b. Simplify $e^{\ln x}$ and give your reasoning.

30. **a.** If $g(x) = \ln x$, what is $g^{-1}(x)$?
   b. Simplify $\ln e^x$ and give your reasoning.

31. **a.** On a single set of axes, graph $y = \ln x$ and $y = \ln (x - 5)$.
   b. Give the domain and zeros of each function.

32. **a.** On a single set of axes, graph $y = -\ln x$ and $y = |\ln x|$.
   b. Give the range of each function.

33. **a.** On separate sets of axes, graph $y = \log |x|$ and $y = |\log x|$.
   b. Give the domain and range of each function.

34. **a.** On separate sets of axes, graph $y = \log_2 (x - 2)$ and $y = \log_2 x - 2$.
   b. Give the domain and range of each function.