

- B 1.** Most scientific calculators have keys for both LN and LOG ($= \log_{10}$). Use such a calculator to draw the graphs of $y = \ln x$ and $y = \log_{10} x$, $0.1 \leq x \leq 10$, on the same axes.
- 2.** Graph each function, not by plotting points, but by starting from the graphs of $y = \log_2 x$, $\log_{10} x$, and $\ln x$ given in this section and using transformations. State the domain, range, and asymptote of each function.

- (a) $f(x) = \log_2(x - 4)$
 (c) $g(x) = \log(-x)$
 (e) $y = 2 + \log_{10} x$
 (g) $y = 1 - \ln x$
 (i) $y = |\ln x|$
- (b) $f(x) = -\log_{10} x$
 (d) $g(x) = \ln(x + 2)$
 (f) $y = \log_2(x - 1) - 2$
 (h) $y = 1 + \ln(-x)$
 (j) $y = \ln|x|$

3. Evaluate without using a calculator.

- (a) $e^{\ln 5}$
 (c) $2 \ln e$
 (e) $\ln \sqrt{e}$
- (b) $\ln e^2$
 (d) $e^{5 \ln 2}$
 (f) $\ln 2 + 2 \ln 3 - \ln 18$

4. Solve for x .

- (a) $e^x = 4$
 (c) $\ln(2x - 1) = 1$
 (e) $\ln(e^{2-x}) = 8$
 (g) $\ln(\ln x) = 2$
- (b) $\ln x = 6$
 (d) $e^{3x+5} = 10$
 (f) $\ln x = \ln 4 + \ln 7$
 (h) $e^{e^x} = 5$

5. Find the solution of each equation correct to six decimal places.

- (a) $\ln(x + 1) = 3$
 (c) $e^{5x+3} = 10$
 (b) $e^{-x} = \frac{7}{2}$
 (d) $2x^{-5} = 3$

6. Express as a single logarithm:

- (a) $\frac{3}{2} \ln x + 2 \ln(3x - 5)$
 (b) $2 \ln x - \frac{7}{2} \ln(x^2 - 1) + 3 \ln(x^2 + 1)$

7. Find the domain of each function.

- (a) $f(x) = \log_{10}(2 + 5x)$
 (b) $f(x) = \log_2(10 - 3x)$
 (c) $g(x) = \log_3(x^2 - 1)$
 (d) $g(x) = \ln(x - x^2)$
- (e) $h(x) = \ln x + \ln(2 - x)$
 (f) $h(x) = \sqrt{x - 2} - \ln(10 - x)$

8. Compare the domains of the functions $f(x) = \ln x^2$ and $g(x) = 2 \ln x$.

9. Find each limit.

- (a) $\lim_{x \rightarrow -4^+} \ln(x + 4)$
 (b) $\lim_{x \rightarrow \infty} \ln(x + 4)$
 (c) $\lim_{x \rightarrow 1^+} \log_{10}(x^2 - x)$
 (d) $\lim_{t \rightarrow \frac{\pi}{2}^-} \ln(\sin t)$