Exercises Logarithms

[1] Evaluate each expression without a calculator.

[a] $9^0 =$ [b] $9^{-1} =$ [c] $9^{\frac{1}{2}} =$ [d] $9^{\frac{3}{2}} =$ [e] $9^2 =$

[f] $9^{-2} =$ [g] $9^{-\frac{1}{2}} =$ [h] $9^{-\frac{3}{2}} =$ [i] $\left(\frac{1}{9}\right)^{\frac{1}{2}} =$ [j] $\left(\frac{1}{9}\right)^{-\frac{1}{2}} =$

[k] $\left(\frac{1}{9}\right)^{\frac{3}{2}} =$ [l] $\left(\frac{1}{9}\right)^{-\frac{3}{2}} =$ [m] $8^0 =$ [n] 8^{-1} [o] $8^{-2} =$

[p] $8^{\frac{1}{3}} =$ [q] $8^2 =$ [r] $8^{\frac{2}{3}} =$ [s] $8^{-\frac{1}{3}}$ [t] $8^{-\frac{2}{3}}$

[u] $\left(\frac{1}{8}\right)^{\frac{1}{3}} =$ [v] $\left(\frac{1}{8}\right)^2 =$ [w] $\left(\frac{1}{8}\right)^{-2} =$ [x] $\left(\frac{1}{8}\right)^{\frac{2}{3}} =$ [y] $\left(\frac{1}{8}\right)^{-\frac{1}{3}} =$

[2] Evaluate each logarithm without a calculator.

[a] $\log_3 9 =$ [b] $\log_9 3 =$ [c] $\log_3 27 =$ [d] $\log_3 \frac{1}{3} =$

[e] $\log_3\left(\frac{1}{9}\right) =$ [f] $\log_3 \sqrt{3} =$ [g] $\log_3\left(\frac{1}{\sqrt{3}}\right) =$ [h] $\log_3 1 =$

[i] $\log_3 3 =$ [j] $\log_3 3^4 =$ [k] $\log_3 3^{10} =$ [l] $\log_3 \frac{1}{3^4} =$

[m] $\log_2 \sqrt[3]{2} =$ [n] $\log_2 \frac{1}{\sqrt[3]{2}} =$ [o] $\log_2 4 =$ [p] $\log_2 8 =$

[q] $\log_2 16 =$ [r] $\log_2 128 =$ [s] $\log_2\left(\frac{1}{8}\right)$ [t] $\log_2\left(\frac{1}{\sqrt{2}}\right)$

[u] $\log_2 32 =$ [v] $\log_2 \frac{1}{32} =$ [w] $\log_2 2^{25}$ [x] $\log_2\left(\frac{1}{2}\right)$

[3] Rewrite each exponential expression as a logarithm.

[a] $5^3 = 125$ _____ [b] $2^{10} = 1024$ _____

[c] $3^{\frac{1}{2}} = \sqrt{3}$ _____ [d] $27^{\frac{2}{3}} = 9$ _____

[e] $10^0 = 1$ _____ [f] $8^1 = 8$ _____

[4] Rewrite each logarithm as an exponential expression.

[a] $\log_3 9 = 2$ _____

[b] $\log_{10} \frac{1}{1000} = -2$ _____

[c] $\log_5 \sqrt[3]{5} = \frac{1}{3}$ _____

[d] $\log_{16} 1 = 0$ _____

[5] Rewrite each expression as a single logarithm.

[a] $\log_2 5 + \log_2 x =$

[b] $2\log_2 3 + 4\log_2 y =$

[c] $3\log_3 x + 4\log_3 y + 2\log_3 z =$

[d] $\log_3 p - \log_3 q =$

[e] $\log_3 x - \log_3 5 =$

[f] $2\log_3 4 - 3\log_3 y =$

[g] $3\log_3 x - 4\log_3 2 =$

[h] $2\log_{10} 5 - 3\log_{10} 3 =$

[6] Expand each expression to as many logarithms as possible.

[a] $\log_2 xy$

[b] $\log_2 5pq$

[c] $\log_3 6x^2$

[d] $\log_3 x^3 y^2 z$

[e] $\log_3 \frac{x}{5}$

[f] $\log_3 \frac{x^2}{y^3}$

[g] $\log_3 \frac{2}{z^3}$

[h] $\log_{10} \frac{xy}{z}$

[i] $\log_3 \frac{yx}{9z}$

[j] $\log_{10} \frac{p^2 q}{st^5}$

[7] Solve each equation.

[a] $\log_3 x = 5$

[b] $\log_2 \left(x^2 + 4\right) = 6$

[c] $5 - 2\log_4 x = 2$

[d] $\log_2 x + \log_2 (x - 4) = 5$

[e] $\log_3 x + \log_3 (x + 8) = 2$

[f] $\log_5 \left(2x + 1\right) + \log_5 (8x + 9) = 3$

[g] $\log_4 \left(3x - 1\right) + \log_4 (x - 1) = 2$

[h] $2^x = 8$

[i] $2^{2x} + 2^x - 6 = 0$

[j] $3^{2x} + 4\left(3^x\right) - 12 = 0$

[k] $5^{2x} - 2\left(5^x\right) - 15 = 0$

[l] $5^{2x} - 2\left(5^x\right) - 3 = 0$

[8] Solve each equation, and give your answer in terms of the natural logarithm..

[a] $2^x = 9$

[b] $3^x = 5$

[c] $2^{x+2} = 3^{x-1}$

[d] $3^{2x+1} = 5^{3x-4}$

[9] Evaluate (calculator): $\frac{1}{0!}+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+\frac{1}{5!}+\frac{1}{6!}+\frac{1}{7!}+\frac{1}{8!}+\frac{1}{9!}+\frac{1}{10!}+\frac{1}{11!}+\frac{1}{12!}+\frac{1}{13!}+\frac{1}{14!}$

[10] Evaluate each expression without a calculator.

[a] $\ln e^4$

[b] $\ln \sqrt{e}$

[c] $\ln \frac{1}{e}$

[d] $\ln e$

[e] $\ln e^{-2}$

[f] $\ln \frac{1}{e^3}$

[g] $\ln \sqrt[3]{e}$

[h] $\ln 1$

[11] Condense each expression to a single logarithm.

[a] $\ln 4 + \ln x$

[b] $2\ln x + 3\ln y$

[c] $\ln p + \ln q + \ln r$

[d] $3\ln 3 + 4\ln 2$

[e] $\ln 2 - \ln y$

[f] $2\ln z - 3\ln 2$

[g] $2\ln p - 5\ln q$

[h] $2\ln 2 - 2\ln 5$

[12] Solve each equation

[a] $\ln 4 + \ln x = \ln 10$

[b] $2\ln x = \ln 9$

[c] $\ln x - \ln 5 = \ln 2$

[d] $3\ln x = \ln 8$

[e] $e^{2x+5} = e^{5x-1}$

[f] $e^{3x} = 2$

[g] $e^{x-2} = 5$

[h] $e^{2x+3} = 10$

[i] $e^{x^2+3x+2} = 1$

[j] $e^{x^2-x-2} = 1$