Review Exercises -- Logarithms

[1] Simplify each expression without a calculator.

[a] 9^{-1} [b] 9^{-2} [c] 9^{0} [d] 9^{3}

[e] $9^{\frac{1}{2}}$ [f] $9^{-\frac{1}{2}}$ [g] $9^{\frac{3}{2}}$ [h] $9^{-\frac{3}{2}}$

[i] $\left(\frac{8}{125}\right)^{\frac{1}{3}}$ [j] $\left(\frac{8}{125}\right)^{-\frac{1}{3}}$ [k] $\left(\frac{8}{125}\right)^{\frac{2}{3}}$ [l] $\left(\frac{8}{125}\right)^{-\frac{2}{3}}$

[2] Rewrite each exponential expression as a logarithm.

[a] $4^3 = 64$ [b] $2^5 = 32$ [c] $e^{\frac{1}{2}} = \sqrt{e}$ [d] $e^0 = 1$

[3] Rewrite each logarithm as an exponential expression.

[a] $\log_3 27 = 3$ [b] $\log_{10}\sqrt{10} = \frac{1}{2}$ [c] $\ln e^2 = 2$ [d] $\ln\frac{1}{e} = -1$

[4] Evaluate each logarithm without a calculator.

[a] $\log_2 4 =$ [b] $\log_4 2 =$ [c] $\log_5 1 =$ [d] $\log_2\frac{1}{2} =$

[e] $\log_{10}\sqrt{10} =$ [f] $\log_6\frac{1}{\sqrt{6}} =$ [g] $\log_8 8 =$ [h] $\log_8 4 =$

[i] $\log_3 81 =$ [j] $\log_3\frac{1}{3} =$ [k] $\log_3 3 =$ [l] $\log_3 1 =$

[m] $\log_3\sqrt[3]{3} =$ [n] $\log_3\frac{1}{\sqrt{3}} =$ [o] $\log_3\frac{1}{9} =$ [p] $\log_3 3^5 =$

[q] $\ln e =$ [r] $\ln\frac{1}{e}$ [s] $\ln e^3$ [t] $\ln\sqrt{e} =$

[5] Rewrite each expression as a single logarithm.

[a] $\log_2 3 + \log_2 y =$ [b] $2\log_2 5 + 3\log_2 x =$ [c] $\log_3 p - \log_3 q =$

[d] $3\log_3 x - 4\log_3 y =$ [e] $\ln x - \ln 5 =$ [f] $2\ln 4 - 3\ln y =$

[6] Expand each expression to as many logarithms as possible. Do not leave exponents in final answers.

[a] $\log_2 4x$ [b] $\log_2\frac{p}{q}$ [c] $\log_3 4x^3$ [d] $\log_3\frac{x^4}{y^6}$ [e] $\ln\frac{x}{5yz}$ [f] $\ln\frac{wx^2}{y^3z^4}$

[7] Solve each equation.

[a] $\log_2 5 + \log_2 x = 3$ [b] $\log_3 x + \log_3(x-2) = 1$ [c] $\ln x + \ln 3 = 1$ [d] $2^{5x-1} = 4$

[e] $5^{x^2} = 25$ [f] $9^x = 27^{5x+2}$ [g] $5^{2x} = 6^{x-3}$ [h] $e^{2x+3} = 10$

[8] Radon-222 has a half-life of 3.8235 days. How long will it take for an initial sample to decay to 10% of its initial value.

[9] After 10 days, a 100g sample of phosphorus-32 has decayed to 61.57g. [a] Find the half-life of phosphorus-32. [b] How long will it take the 100g sample to decay to only 1.00g? [c] Find the decay rate.

[10] A small town has a population of 12342 people and its population is growing at 2.13% per year. [a] Project the population 4 years from now. [b] How long will it take the population to reach 15000?

[11] A large city had a population of 542,900 five years ago. Due to economic decline, its current population is 524,700. [a] Find the rate of decline for this population. [b] Predict the population in 9 years. [c] How long will it take the population to decline to half a million?