

Exponential and Logarithmic Functions Worksheet

1. Solve each equation:

(a) $9^{2y-1} = 27^y$

(b) $\frac{1}{2} = \left(\frac{b}{4}\right)^{1/4}$

(c) $\ln(x+1) - \ln(x) = 1$

(d) $32^t = 16^{1-t}$

(e) $\log_{10}(e^x) = 1$

(f) $e^{e^x} = 2$

2. Write each expression as a single logarithm. Assume all variables represent positive real numbers.

(a) $-\frac{3}{4} \log_x a^6 b^8 + \frac{2}{3} \log_x a^9 b^3$

(b) $\log_b(2y+5) - \frac{1}{2} \log_b(y+3)$

(c) $(\log_b k - \log_b m) - \log_b a$

(d) $2 \log_a(z-1) + \log_a(3z+2)$

(e) $\log_a(pq^2) + 2 \log_a(p/q)$

3. Write each of the following expressions as a sum, difference, or product of logarithms (and simplify if possible). Assume that all variables represent positive real numbers.

(a) $\log_5 \frac{5\sqrt{7}}{3}$

(b) $\log_z \frac{x^5 y^3}{3}$

(c) $\log_p \sqrt[3]{\frac{m^5 n^4}{t^2}}$

(d) $\log_6(7m-3q)$

(e) $\log_3 \frac{4p}{q}$

4. Differentiate or Integrate, as indicated:

(a) $\frac{d}{dx} 3^{x^2+\sin(x)} =$

(b) $\frac{d}{dx} \log_5(x^2 + e^{3x}) =$

(c) $\frac{d}{dx} \log_x(3x+1) =$

(d) $\frac{d}{dx} \sin^{-1}(e^x) =$

(e) $\frac{d}{dx} \ln\left(\frac{1}{x}\right) + \frac{1}{\ln(x)} =$

(f) $\int \frac{x^2 + x + 1}{x} dx =$

(g) $\int \frac{x+1}{x^2+2x} dx =$

(h) $\int 5^t dt =$

(i) $\int \frac{1}{w \ln(w)} dw =$