

Exercise 1 Find the derivative of the function $f(x) = \ln(|x|)$.

Exercise 2 Find the derivative of the function $g(x) = 5^x + x^5 + \log_5(x) + 5 + \frac{5}{x} + \frac{x}{5} + \sqrt[5]{x}$.

Exercise 3 Differentiate the function.

(a) $f(x) = x \ln(x) - x$

(b) $f(x) = \ln(\sin^2(x))$

(c) $y = \frac{1}{\ln(x)}$

(d) $h(x) = \ln(x + \sqrt{x^2 - 1})$

(e) $H(z) = \ln \left(\sqrt{\frac{a^2 - z^2}{a^2 + z^2}} \right)$

(f) $y = \log_2(x \log_5(x))$

Exercise 4 Use logarithmic differentiation to find the derivative of the function.

(a) $y = \sqrt{x}e^{x^2-x}(x+1)^{2/3}$

(b) $y = x^{\cos(x)}$

(c) $y = (\sin(x))^{\ln(x)}$

Exercise 5 Find y' if $x^y = y^x$.

Exercise 6 Show that

$$\lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n = e^x$$

for any $x > 0$.