

Derivatives of Exponential Functions with Base e

Learning Objectives

- Find the derivative of an exponential function with base e
 - Find the derivative of an exponential function with any base
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Find the derivative of an exponential function with base e

1. Find the derivative of the function $f(x) = 4e^x + 2x^e + 11$.

Find the derivative of an exponential function with any base

2. Find the derivative of the following functions.

- a. $g(x) = 3^x + x$

- b. $h(x) = \left(\frac{1}{2}\right)^x - x^2$

c. $m(x) = \pi^x + \frac{9}{x} + \sqrt{x}$

The letter e is a constant approximately equal to 2.72, and $\ln(e) = 1$.

Any time a constant is in the base and a variable is in the exponent follow the rule $\frac{d}{dx}(a^x) = (\ln a)a^x$. Whenever a constant is in the exponent and a variable is in the base, use the power rule.

ANSWER KEY

1. $f'(x) = 4e^x + 2ex^{e-1}$

2. a. $g'(x) = (\ln 3) 3^x + 1$, b. $h'(x) = \left(\ln \frac{1}{2}\right) \left(\frac{1}{2}\right)^x - 2x$, c. $m'(x) = (\ln \pi)\pi^x - \frac{9}{x^2} + \frac{1}{2\sqrt{x}}$