

Exercise: Calculate the derivative of arc cotg (ctg(x)):

$$[\text{arc ctg}(\text{ctg}(x))]^{\prime} = \frac{-1}{1 + \text{ctg}^2 x} \cdot \frac{-1}{\sin^2 x} =$$

The derivative of arc cotangent of cotangent of x

The outer function's derivative is minus one over the squared argument

The inner function's derivative is minus one over sine square of x

it is possible to simplify

$$= \frac{(-1) \cdot (-1)}{(1 + \text{ctg}^2 x) \cdot \sin^2 x} = \frac{1}{(1 + \frac{\cos^2 x}{\sin^2 x}) \sin^2 x} =$$

We multiply the two components

Cotangent square of x is the same as cosine square of over sine square of x

$$\frac{1}{\sin^2 x + \frac{\cos^2 x \cdot \sin^2 x}{\sin^2 x}} = \frac{1}{1} = 1$$

From pythagorean identity we know that sine square of x plus cosine square of x is equal one

One divided by one is, obviously, one

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Exercise: Calculate the derivative of $\log_3(\sin(x) \cdot \operatorname{tg}(x))$

$$[\log_3(\sin(x) \cdot \operatorname{tg}(x))] = \frac{1}{\sin(x) \cdot \operatorname{tg}(x) \cdot \ln 3} \cdot$$

The derivative of base three logarithm of sine of x times tangent of x

The most outer function is the base three logarithm, and its derivative is one over the product of its argument and natural logarithm of the base, which is three

• $[(\cos(x) \cdot \operatorname{tg}(x)) + (\sin(x) \frac{1}{\cos^2 x})]$

The inner function is the product of two functions, tangent of x and sine of x . Its derivative is the sum of cosine of x , which is the derivative of sine of x , times tangent of x , and one over cosine square of x , which is the derivative of tangent of x , times sine of x

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Exercise: Calculate the derivative of $\sin(x) \cdot \cos(x) \cdot \ln(x)$

$$[\sin(x) \cdot (\cos(x) \cdot \ln(x))]' = \cos(x) \cdot (\cos(x) \cdot \ln(x)) +$$

The derivative of a sine of x times cosine of x times natural logarithm of x .

Lets consider cosine of x times natural logarithm as one function and sine of x

The derivative of the first function is cosine of x

$$+ \sin(x) [(-\sin(x) \cdot \ln(x)) + (\cos(x) \cdot \frac{1}{x})]$$

The derivative of the second function is the sum of negative sine of x , which is the derivative of the cosine, times natural logarithm of x , and cosine of x times one over x , which is the derivative of natural logarithm of x . The sum is multiplied the other function, sine of x

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