

# Table of derivatives

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The *derivative* of a function  $f : \mathbb{R} \rightarrow \mathbb{R}$  is defined as

$$\frac{df}{dx}(x_0) = \lim_{h \rightarrow 0} \frac{f(x_0 + h) - f(x_0)}{h}.$$

## The derivative of linear combinations.

If  $f, g$  are functions and  $c \in \mathbb{R}$  then

$$\frac{df + c \cdot g}{dx} = \frac{df}{dx} + c \cdot \frac{dg}{dx}$$

## The derivative of a product.

If  $f, g$  are functions

$$\frac{df \cdot g}{dx} = g \cdot \frac{df}{dx} + f \cdot \frac{dg}{dx}$$

## The chain rule.

If  $f, g$  are functions

$$\frac{dg(f)}{dx} = \frac{dg}{df} \cdot \frac{df}{dx}$$

## Derivatives of common functions.

$\frac{dx^k}{dx} = kx^{k-1}, k \in \mathbb{R}$	$\frac{da^x}{dx} = a^x \ln_a(x)$	$\frac{d \ln_a(x)}{dx} = \frac{1}{\ln(a) \cdot x}$
$\frac{d \sin(x)}{dx} = \cos(x)$	$\frac{d \cos(x)}{dx} = -\sin(x)$	$\frac{d \tan}{dx} = \sec(x)^2$
$\frac{d \cot(x)}{dx} = -\csc(x)^2$	$\frac{d \sec(x)}{dx} = \sec(x) \cdot \tan(x)$	$\frac{d \csc}{dx} = -\csc(x) \cdot \cot(x)$
$\frac{d \arcsin(x)}{dx} = \frac{1}{\sqrt{1-x^2}}$	$\frac{d \arccos(x)}{dx} = \frac{-1}{\sqrt{1-x^2}}$	$\frac{d \arctan}{dx} = \frac{1}{1+x^2}$
$\frac{d \operatorname{arccot}(x)}{dx} = \frac{-1}{1+x^2}$	$\frac{d \operatorname{arcsec}(x)}{dx} = \frac{1}{ x \sqrt{1-x^2}}$	$\frac{d \operatorname{arccsc}}{dx} = \frac{-1}{ x \sqrt{1-x^2}}$

Recall that the absolute value function is defined in the following way

$$|x| = \begin{cases} x & \text{if } x > 0 \\ -x & \text{otherwise} \end{cases}$$