

## Basic Derivatives Formulas

The definition of the derivative of  $f(x)$  with respect to  $x$  is

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}.$$

In the following table,  $u$  and  $v$  are functions of  $x$  and  $k$  is a constant.

Function	Derivative wrt $x$
$u + v$	$u' + v'$
$u \cdot v$	$u'v + uv'$
$f(u)$	$f'(u) \cdot u'$
$e^x$	$e^x$
$\sin x$	$\cos x$
$\tan x$	$\sec^2 x$
$\sec x$	$\sec x \tan x$
$\arcsin x$	$\frac{1}{\sqrt{1-x^2}}$

Function	Derivative wrt $x$
$k \cdot u$	$ku'$
$\frac{u}{v}$	$\frac{u'v - uv'}{v^2}$
$x^n$	$nx^{n-1}$
$\ln x$	$\frac{1}{x}$
$\cos x$	$-\sin x$
$\cot x$	$-\csc^2 x$
$\csc x$	$-\csc x \cot x$
$\arctan x$	$\frac{1}{x^2 + 1}$