

**Short Table of Derivatives of  $y = f(u)$  with respect to  $x$ , where  $u$  is a function of  $x$**

Functions, $y = f(u)$	Derivative of $y$ with respect to $x$
$y = c$ , where $c$ is a constant.	$\frac{dy}{dx} = 0$
$y = cu$ , where $c$ is a constant.	$\frac{dy}{dx} = c \frac{du}{dx}$
$y = u^p$ , where $p$ is a constant.	$\frac{dy}{dx} = pu^{p-1} \frac{du}{dx}$
$y = u + v$	$\frac{dy}{dx} = \frac{du}{dx} + \frac{dv}{dx}$
$y = uv$	$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$
$y = \frac{u}{v}$	$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$
$y = f(u)$ , where $u$ is a function of $x$ .	$\frac{dy}{dx} = \frac{d f(u)}{du} \cdot \frac{du}{dx}$ , the chain rule
$y = \log_a u$ , $a > 0$ .	$\frac{dy}{dx} = \frac{1}{u} \log_a e \frac{du}{dx}$
$y = a^u$ , $a > 0$ .	$\frac{dy}{dx} = a^u \log_e a \frac{du}{dx}$
$y = e^u$	$\frac{dy}{dx} = e^u \frac{du}{dx}$
$y = u^v$	$\frac{dy}{dx} = vu^{v-1} \frac{du}{dx} + u^v \log_e u \frac{dv}{dx}$
$y = \sin u$	$\frac{dy}{dx} = \cos u \frac{du}{dx}$
$y = \cos u$	$\frac{dy}{dx} = -\sin u \frac{du}{dx}$
$y = \tan u$	$\frac{dy}{dx} = \sec^2 u \frac{du}{dx}$
$y = \cot u$	$\frac{dy}{dx} = -\operatorname{cosec}^2 u \frac{du}{dx}$
$y = \sec u$	$\frac{dy}{dx} = \sec u \tan u \frac{du}{dx}$
$y = \operatorname{cosec} u$	$\frac{dy}{dx} = -\operatorname{cosec} u \cot u \frac{du}{dx}$
$y = \sin^{-1} u$	$\frac{dy}{dx} = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$
$y = \cos^{-1} u$	$\frac{dy}{dx} = \frac{-1}{\sqrt{1-u^2}} \frac{du}{dx}$
$y = \tan^{-1} u$	$\frac{dy}{dx} = \frac{1}{1+u^2} \frac{du}{dx}$

Functions, $y = f(u)$	Derivative of $y$ with respect to $x$
$y = \cot^{-1} u$	$\frac{dy}{dx} = -\frac{1}{1+u^2} \frac{du}{dx}$
$y = \sec^{-1} u$	$\frac{dy}{dx} = \frac{1}{ u \sqrt{u^2-1}} \frac{du}{dx}$
$y = \operatorname{cosec}^{-1} u$	$\frac{dy}{dx} = -\frac{1}{ u \sqrt{u^2-1}} \frac{du}{dx}$
$y = \sinh u$	$\frac{dy}{dx} = \cosh u \frac{du}{dx}$
$y = \cosh u$	$\frac{dy}{dx} = \sinh u \frac{du}{dx}$
$y = \tanh u$	$\frac{dy}{dx} = \operatorname{sech}^2 u \frac{du}{dx}$
$y = \coth u$	$\frac{dy}{dx} = -\operatorname{cosech}^2 u \frac{du}{dx}$
$y = \operatorname{sech} u$	$\frac{dy}{dx} = -\operatorname{sech} u \tanh u \frac{du}{dx}$
$y = \operatorname{cosech} u$	$\frac{dy}{dx} = -\operatorname{cosech} u \coth u \frac{du}{dx}$
$y = \sinh^{-1} u$	$\frac{dy}{dx} = \frac{1}{\sqrt{1+u^2}} \frac{du}{dx}$
$y = \cosh^{-1} u$	$\frac{dy}{dx} = \frac{1}{\sqrt{u^2-1}} \frac{du}{dx}$
$y = \tanh^{-1} u$	$\frac{dy}{dx} = \frac{1}{1-u^2} \frac{du}{dx}$
$y = \coth^{-1} u$	$\frac{dy}{dx} = \frac{1}{1-u^2} \frac{du}{dx}$
$y = \operatorname{sech}^{-1} u$	$\frac{dy}{dx} = -\frac{1}{u\sqrt{1-u^2}} \frac{du}{dx}$
$y = \operatorname{cosech}^{-1} u$	$\frac{dy}{dx} = -\frac{1}{ u \sqrt{u^2+1}} \frac{du}{dx}$