Derivatives of Basic Functions

Function	Derivative	Domain of derivative
c (constant)	0	$\mathbb{R}$
x	1	$\mathbb{R}$
x^n , $n \geq 1$ integer	nx^{n-1}	$\mathbb{R}$
x^r , r real	rx^{r-1}	At least $(0,\infty)$
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	$(0,\infty)$
$\ln x$	$\frac{1}{x}$	$(0,\infty)$
$\log_a x$	$\frac{1}{x \ln a}$	$(0,\infty)$
e^x	e^x	$\mathbb{R}$
a^x , $a > 0, a \neq 1$	$a^x \ln a$	$\mathbb{R}$
$\sin x$	$\cos x$	$\mathbb{R}$
$\cos x$	$-\sin x$	$\mathbb{R}$
$\tan x$	$\frac{1}{\cos^2 x} = \sec^2 x$	$\cos x \neq 0$
$\cot x$	$-\frac{1}{\sin^2 x} = -\csc^2 x$	$\sin x \neq 0$
$\sec x$	$\sec x \tan x$	$\cos x \neq 0$
$\csc x$	$-\csc x \cot x$	$\sin x \neq 0$
$\sin^{-1} x$	$\frac{1}{\sqrt{1-x^2}}$	$(-1,1)$
$\cos^{-1} x$	$\frac{-1}{\sqrt{1-x^2}}$	$(-1,1)$
$\tan^{-1} x$	$\frac{1}{1+x^2}$	$\mathbb{R}$
$\cot^{-1} x$	$\frac{-1}{1+x^2}$	$\mathbb{R}$
$\sec^{-1} x$	$\frac{1}{\lvert x \rvert \sqrt{x^2-1}}$	$(-\infty,-1) \cup (1,\infty)$
$\csc^{-1} x$	$\frac{-1}{\lvert x \rvert \sqrt{x^2-1}}$	$(-\infty,-1) \cup (1,\infty)$

Derivatives of Composed Functions

Function	Derivative	Domain of derivative
$u = u(x)$	u'	
u^n, $n \ge 1$ integer	$nu^{n-1} \cdot u'$	
u^r, r real	$ru^{r-1} \cdot u'$	$u > 0$
$\sqrt{u}$	$\frac{1}{2\sqrt{u}} \cdot u'$	$u > 0$
$\ln u$	$\frac{1}{u} \cdot u'$	$u > 0$
$\log_a u$	$\frac{1}{u \ln a} \cdot u'$	$u > 0$
e^u	$e^u \cdot u'$	
a^u, $a > 0, a \ne 1$	$a^u \ln a \cdot u'$	
$\sin u$	$\cos u \cdot u'$	
$\cos u$	$-\sin u \cdot u'$	
$\tan u$	$\frac{1}{\cos^2 u} \cdot u' = (\sec^2 u)u'$	$\cos u \ne 0$
$\cot u$	$-\frac{1}{\sin^2 u} \cdot u' = (-\csc^2 u)u'$	$\sin u \ne 0$
$\sec u$	$\sec u \tan u \cdot u'$	$\cos u \ne 0$
$\csc u$	$-\csc u \cot u \cdot u'$	$\sin u \ne 0$
$\sin^{-1} u$	$\frac{1}{\sqrt{1-u^2}} \cdot u'$	$u \in (-1,1)$
$\cos^{-1} u$	$\frac{-1}{\sqrt{1-u^2}} \cdot u'$	$u \in (-1,1)$
$\tan^{-1} u$	$\frac{1}{1+u^2} \cdot u'$	
$\cot^{-1} u$	$\frac{-1}{1+u^2} \cdot u'$	
$\sec^{-1} u$	$\frac{1}{\lvert u\rvert\sqrt{u^2-1}} \cdot u'$	$u \in (-\infty,-1) \cup (1,\infty)$
$\csc^{-1} u$	$\frac{-1}{\lvert u\rvert\sqrt{u^2-1}} \cdot u'$	$u \in (-\infty,-1) \cup (1,\infty)$

If u and v are differentiable functions and $u > 0$, then $u^v = e^{\ln u^v} = e^{v \ln u}$, and

$$\left(u^v\right)' = \left(e^{v \ln u}\right)' = e^{v \ln u}\left(v' \ln u + v\frac{u'}{u}\right) = u^v\left(v' \ln u + v\frac{u'}{u}\right)$$