Derivatives

Basic derivatives

y	y'	y	y'
k	0		
x	1		
x^n	nx^{n-1}	u^n	$nu^{n-1}u'$
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$	$\sqrt{u}$	$\frac{u'}{2\sqrt{u}}$
$\sqrt[n]{x}$	$\frac{1}{n\sqrt[n]{x^{n-1}}}$	$\sqrt[n]{u}$	$\frac{u'}{n\sqrt[n]{u^{n-1}}}$
$\frac{1}{x}$	$\frac{-1}{x^2}$	$\frac{1}{u}$	$\frac{-u'}{u^2}$
e^x	e^x	e^u	$e^u u'$
a^x	$a^x \ln(a)$	a^u	$a^u \ln(a) u'$
x^x	$xx^{x-1} + x^x \ln(x)$	u^v	$vu^{v-1}u' + u^v \ln(u)v'$
$\ln(x)$	$\frac{1}{x}$	$\ln u$	$\frac{u'}{u}$
$\log_a(x)$	$\frac{1}{x}\log_a(e)$	$\log_a(u)$	$\frac{u'}{u}\log_a(e)$
$\sin(x)$	$\cos(x)$	u	$\cos(u)u'$
$\cos(x)$	$-\sin(x)$	$\cos(u)$	$-\sin(u)u'$
$\tan(x)$	$\frac{1}{\cos(x)^2}$	$\tan(u)$	$\frac{u'}{\cos(u)^2}$
$\cot(x)$	$\frac{-1}{\sin(x)^2}$	$\cot(u)$	$\frac{-u'}{\sin(u)^2}$
$\sec(x)$	$\frac{\sin(x)}{\cos(x)^2}$	$\sec(u)$	$\frac{\sin(u)}{\cos(u)^2}u'$
$\csc(x)$	$\frac{-\cos(x)}{\sin(x)^2}$	$\csc(u)$	$\frac{-\cos(x)}{\sin(x)^2}$
$\arcsin(x)$	$\frac{1}{\sqrt{1-x^2}}$	$\arcsin(u)$	$\frac{u'}{\sqrt{1-u^2}}$
$\arccos(x)$	$\frac{-1}{\sqrt{1-x^2}}$	$\arccos(u)$	$\frac{-u'}{\sqrt{1-u^2}}$
$\arctan(x)$	$\frac{1}{1+x^2}$	$\arctan(u)$	$\frac{u'}{1+u^2}$
$\operatorname{arccot}(x)$	$\frac{-1}{1+x^2}$	$\operatorname{arccot}(u)$	$\frac{-u'}{1+u^2}$
$\operatorname{arcsec}(x)$	$\frac{1}{x\sqrt{x^2-1}}$	$\operatorname{arcsec}(u)$	$\frac{u'}{u\sqrt{u^2-1}}$
$\operatorname{arccsc}(x)$	$\frac{-1}{x\sqrt{x^2-1}}$	$\operatorname{arccsc}(u)$	$\frac{-u'}{u\sqrt{u^2-1}}$

Derivative rules

Sum

$$(f(x)+g(x))' = f'(x)+g'(x)$$

Difference

$$(f-g)'(x) = f'(x)-g'(x)$$

Product

$$(fg)'(x) = f'(x)g(x)+f(x)g'(x)$$

Sum

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x)-f(x)g'(x)}{g(x)^2}$$

Chain rule

$$(f(g))'(x) = f'(g(x))g'(x)$$

Inverse

$$f^{-1\prime}(x) = \frac{1}{f'(x)}$$