Derivatives Cheat Sheet

Derivatives Rules

Power Rule	$\frac{d}{dx}\left(x^a\right) = a \cdot x^{a-1}$
Derivative of a constant	$\frac{d}{dx}(a) = 0$
Sum Difference Rule	$(f \pm g)' = f' \pm g'$
Constant Out	$(a \cdot f)' = a \cdot f'$
Product Rule	$(f \cdot g)' = f' \cdot g + f \cdot g'$
Quotient Rule	$\left(\frac{f}{g}\right)' = \frac{f' \cdot g - g' \cdot f}{g^2}$
Chain rule	$\frac{df(u)}{dx} = \frac{df}{du} \cdot \frac{du}{dx}$

Common Derivatives

$\frac{d}{dx}\left(\ln(x)\right) = \frac{1}{x}$

$\frac{d}{dx}\left(\ln(|x|)\right) = \frac{1}{x}$

$\frac{d}{dx}\left(e^x\right) = e^x$

$\frac{d}{dx}\left(\log(x)\right) = \frac{1}{x\ln(10)}$

$\frac{d}{dx}\left(\log_a(x)\right) = \frac{1}{x\ln(a)}$

Trigonometric Derivatives

$\frac{d}{dx}\left(\sin(x)\right) = \cos(x)$

$\frac{d}{dx}\left(\cos(x)\right) = -\sin(x)$

$\frac{d}{dx}\left(\tan(x)\right) = \sec^2(x)$

$\frac{d}{dx}\left(\sec(x)\right) = \frac{\tan(x)}{\cos(x)}$

$$\frac{d}{dx}\left(\csc(x)\right) = \frac{-\cot(x)}{\sin(x)} \qquad \frac{d}{dx}\left(\cot(x)\right) = -\frac{1}{\sin^2(x)}$$

Arc Trigonometric Derivatives

$$\frac{d}{dx}\left(\arcsin(x)\right) = \frac{1}{\sqrt{1-x^2}} \qquad \frac{d}{dx}\left(\arccos(x)\right) = -\frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\left(\arctan(x)\right) = \frac{1}{x^2+1} \qquad \frac{d}{dx}\left(\operatorname{arcsec}(x)\right) = \frac{1}{\sqrt{x^2}\sqrt{x^2-1}}$$

$$\frac{d}{dx}\left(\operatorname{arccsc}(x)\right) = -\frac{1}{\sqrt{x^2}\sqrt{x^2-1}} \qquad \frac{d}{dx}\left(\operatorname{arccot}(x)\right) = -\frac{1}{x^2+1}$$

Hyperbolic Derivatives

$$\frac{d}{dx}\left(\sinh(x)\right) = \cosh(x) \qquad \frac{d}{dx}\left(\cosh(x)\right) = \sinh(x)$$

$$\frac{d}{dx}\left(\tanh(x)\right) = \operatorname{sech}^2(x) \qquad \frac{d}{dx}\left(\operatorname{sech}(x)\right) = \tanh(x)\left(-\operatorname{sech}(x)\right)$$

$$\frac{d}{dx}\left(\operatorname{csch}(x)\right) = -\coth(x)\operatorname{csch}(x) \qquad \frac{d}{dx}\left(\coth(x)\right) = -\operatorname{csch}^2(x)$$

Arc Hyperbolic Derivatives

$$\frac{d}{dx}\left(\operatorname{arcsinh}(x)\right) = \frac{1}{\sqrt{x^2+1}} \qquad \frac{d}{dx}\left(\operatorname{arccosh}(x)\right) = \frac{1}{\sqrt{x-1}\sqrt{x+1}}$$

$$\frac{d}{dx}\left(\operatorname{arctanh}(x)\right) = \frac{1}{1-x^2} \qquad \frac{d}{dx}\left(\operatorname{arcsech}(x)\right) = \frac{\sqrt{\frac{2}{x+1}-1}}{(x-1)x}$$

$$\frac{d}{dx}\left(\operatorname{arccsch}(x)\right) = -\frac{1}{\sqrt{\frac{1}{x^2}+1}\,x^2} \qquad \frac{d}{dx}\left(\operatorname{arccoth}(x)\right) = \frac{1}{1-x^2}$$