GOVIND CLASSES
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Derivatives

Basic Properties/Formulas/Rules

$\frac{d}{dx}\left(cf(x)\right)=cf'(x)$, c is any constant.

$\left(f(x)\pm g(x)\right)'=f'(x)\pm g'(x)$

$\frac{d}{dx}\left(x^n\right)=nx^{n-1}$, n is any number.

$\frac{d}{dx}(c)=0$, c is any constant.

$(fg)'=f'g+fg'$ – **(Product Rule)**

$\left(\frac{f}{g}\right)'=\frac{f'g-fg'}{g^2}$ – **(Quotient Rule)**

$\frac{d}{dx}\left(f\left(g(x)\right)\right)=f'\left(g(x)\right)g'(x)$ **(Chain Rule)**

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

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

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Common Derivatives

Polynomials

$\frac{d}{dx}(c)=0$ $\frac{d}{dx}(x)=1$ $\frac{d}{dx}(cx)=c$ $\frac{d}{dx}\left(x^n\right)=nx^{n-1}$ $\frac{d}{dx}\left(cx^n\right)=ncx^{n-1}$

Trig Functions

$\frac{d}{dx}(\sin x)=\cos x$ $\frac{d}{dx}(\cos x)=-\sin x$ $\frac{d}{dx}(\tan x)=\sec^2 x$

$\frac{d}{dx}(\sec x)=\sec x\tan x$ $\frac{d}{dx}(\csc x)=-\csc x\cot x$ $\frac{d}{dx}(\cot x)=-\csc^2 x$

Inverse Trig Functions

$\frac{d}{dx}\left(\sin^{-1}x\right)=\frac{1}{\sqrt{1-x^2}}$ $\frac{d}{dx}\left(\cos^{-1}x\right)=-\frac{1}{\sqrt{1-x^2}}$ $\frac{d}{dx}\left(\tan^{-1}x\right)=\frac{1}{1+x^2}$

$\frac{d}{dx}\left(\sec^{-1}x\right)=\frac{1}{|x|\sqrt{x^2-1}}$ $\frac{d}{dx}\left(\csc^{-1}x\right)=-\frac{1}{|x|\sqrt{x^2-1}}$ $\frac{d}{dx}\left(\cot^{-1}x\right)=-\frac{1}{1+x^2}$

Exponential/Logarithm Functions

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

$\frac{d}{dx}\left(\ln(x)\right)=\frac{1}{x},\ x>0$ $\frac{d}{dx}\left(\ln|x|\right)=\frac{1}{x},\ x\neq 0$ $\frac{d}{dx}\left(\log_a(x)\right)=\frac{1}{x\ln a},\ x>0$

Hyperbolic Trig Functions

$\frac{d}{dx}(\sinh x)=\cosh x$ $\frac{d}{dx}(\operatorname{sech} x)=-\operatorname{sech} x\tanh x$ $\frac{d}{dx}(\cosh x)=\sinh x\, dx$

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