Derivatives of functions

Derivatives of algebraic functions

$$\frac{d\,x^{\,n}}{dx} = nx^{\,n-1}$$

Derivatives of exponential and logarithmic functions

i) $\dfrac{d(e^{x})}{dx} = e^{x}$

ii) $\dfrac{d(a^{x})}{dx} = a^{x} \log_{e} a$

ii) $\dfrac{d(\log x)}{dx} = \dfrac{1}{x}$

iv) $\dfrac{d(\log_{a} x)}{dx} = \dfrac{1}{x \log_{e} a}$

Derivatives of Trigonometric Functions

i) $\dfrac{d\,(\sin x)}{dx} = \cos x$

ii) $\dfrac{d(\cos x)}{dx} = -\sin x$

iii) $\dfrac{d(\tan x)}{dx} = \sec^2 x$

iv) $\dfrac{d(\cot x)}{dx} = -\csc^2 x$

v) $\dfrac{d(\sec x)}{dx} = \sec x \tan x$

vi) $\dfrac{d(\csc x)}{dx} = -\csc x \cot x$

Derivatives of Inverse Trigonometric Functions

i) $\dfrac{d(\sin^{-1}x)}{dx} = \dfrac{1}{\sqrt{(1-x^2)}}$; $|x| \leq 1$

ii) $\dfrac{d(\cos^{-1}x)}{dx} = \dfrac{-1}{\sqrt{(1-x^2)}}$; $|x| \leq 1$

iii) $\dfrac{d(\tan^{-1}x)}{dx} = \dfrac{1}{1+x^2}$

iv) $\dfrac{d(\cot^{-1}x)}{dx} = \dfrac{-1}{1+x^2}$

v) $\dfrac{d(\sec^{-1}x)}{dx} = \dfrac{1}{|x|\sqrt{(x^2-1)}}$; $|x| \geq 1$

vi) $\dfrac{d(\csc^{-1}x)}{dx} = \dfrac{-1}{|x|\sqrt{(x^2-1)}}$; $|x| \geq 1$

Derivatives of Hyperbolic functions

1) $\frac{d\,(\sinh x)}{dx} = \cosh x$ for x $\in \mathbb{R}$

2) $\frac{d(\cosh x)}{dx} = \sinh x$ for x $\in \mathbb{R}$

3) $\frac{d(\tanh x)}{dx} = \operatorname{sech}^2 x$ for x $\in \mathbb{R}$

4) $\frac{d(\coth x)}{dx} = -\operatorname{cosech}^2 x$ for x $\neq 0$

5) $\frac{d(\operatorname{sech} x)}{dx} = -\tanh x \operatorname{sech} x$ for x $\in \mathbb{R}$

6) $\frac{d(\operatorname{cosech} x)}{dx} = -\coth x \operatorname{cosech} x$ for x $\neq 0$

Derivatives of Inverse Hyperbolic functions

i) $\dfrac{d(\sinh^{-1}x)}{dx} = \dfrac{1}{\sqrt{1+x^2}}$ for $x \in \mathbb{R}$

ii) $\dfrac{d(\cosh^{-1}x)}{dx} = \dfrac{1}{\sqrt{x^2-1}}$ for $|x| > 1$

iii) $\dfrac{d(\tanh^{-1}x)}{dx} = \dfrac{1}{1-x^2}$ for $|x| < 1$

iv) $\dfrac{d(\coth^{-1}x)}{dx} = \dfrac{1}{x^2-1}$ for $|x| > 1$

v) $\dfrac{d(\operatorname{sech}^{-1}x)}{dx} = \dfrac{1}{x\sqrt{1-x^2}}$ for $|x| < 1$

i) $\dfrac{d(\operatorname{cosech}^{-1}x)}{dx} = \dfrac{1}{|x|\sqrt{1+x^2}}$ for $x \in \mathbb{R}$