

Derivative of Inverse Hyperbolic functions : Example

find derivative w.r.t x^2

$$y = \tan^{-1}(\operatorname{sech} x^2)$$

$$u = x^2$$

$$\therefore \frac{du}{dx} = 2x$$

$$\frac{dy}{dx} = \frac{1}{1 + \operatorname{sech}^2 x^2} \frac{d}{dx}(\operatorname{sech} x^2)$$

$$= \frac{1}{1 + \operatorname{sech}^2 x^2} \cdot (-\operatorname{sech} x^2 \tanh x^2) (2x)$$

$$= \frac{-2x \operatorname{sech} x^2 \tanh x^2}{1 + \operatorname{sech}^2 x^2}$$

$$\frac{dy}{du} = \frac{\frac{dy}{dx}}{\frac{du}{dx}} = \frac{-\cancel{2x} \operatorname{sech} x^2 \tanh x^2}{1 + \operatorname{sech} x^2}$$

$$\frac{dy}{du} = -\frac{\operatorname{sech} x^2 \tanh x^2}{1 + \operatorname{sech} x^2}$$

Ans.

