

# Calculus

## Derivatives of Hyperbolic And Inverse Hyperbolic Functions

### Important Questions (pyq)

Differentiate

$\sin^{-1}(\tanh x^2)$  w.r.t.  $x^2$ .

Sol =

$$y = \sin^{-1}(\tanh x^2)$$

Let  $x^2 = u$ .

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

(1)

$$\frac{dy}{dx} = \frac{1}{\sqrt{1 - \tanh^2 x^2}} \cdot \sec^2 x^2 \cdot 2x$$



$$\frac{dy}{dx} = \frac{2x \cdot \operatorname{sech}^2 x^2}{\operatorname{sech} x^2}$$

$$\frac{dy}{dx} = 2x \cdot \operatorname{sech} x^2 \quad \text{--- (1)}$$

$$\frac{dy}{du} =$$

$$\frac{dy/dx}{du/dx} = \frac{2x \operatorname{sech} x^2}{2x}$$

$$= \operatorname{sech} x^2 \quad \underline{\text{Ans.}}$$

[ from (1) ]  
+ (1)]