Derivative of Hyperbolic functions : Example

$$y = (\sin x)^{\sinh x}$$

$$\log y = \log (\sin x)^{\sinh x} \quad \text{Taking Log Both side}$$

$$\log y = \sinh x \cdot \log (\sin x)$$

$$\frac{1}{y}\frac{dy}{dx} = \sinh x \frac{1}{\sin x}\frac{d}{dx}(\sin x) + \log(\sin x).\cosh x$$

$$= \sinh x \frac{1}{\sin x} \cdot \cos x + \log(\sin x) \cdot \cosh x$$

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$$\frac{dy}{dx} = y\left[\sinh x \cot x + \log(\sin x)\cosh x\right]$$

$$= (\sin x)^{\sinh x}\left[\sinh x \cot x + \log(\sin x)\cosh x\right]$$

Ans.

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