

$$y = \ln(u) \Rightarrow y' = \frac{u'}{u} \quad \int \frac{du}{u} = \ln|u| + C$$

### Table of Derivatives of Inverse Trigonometric Functions

$$\begin{aligned}\frac{d}{dx}(\sin^{-1}x) &= \frac{1}{\sqrt{1-x^2}} & \frac{d}{dx}(\csc^{-1}x) &= -\frac{1}{x\sqrt{x^2-1}} \\ \frac{d}{dx}(\cos^{-1}x) &= -\frac{1}{\sqrt{1-x^2}} & \frac{d}{dx}(\sec^{-1}x) &= \frac{1}{x\sqrt{x^2-1}} \\ \frac{d}{dx}(\tan^{-1}x) &= \frac{1}{1+x^2} & \frac{d}{dx}(\cot^{-1}x) &= -\frac{1}{1+x^2}\end{aligned}$$

### Derivatives of Hyperbolic Functions

$$\begin{aligned}\frac{d}{dx}(\sinh x) &= \cosh x & \frac{d}{dx}(\cosh x) &= \sinh x & \frac{d}{dx}(\tanh x) &= \operatorname{sech}^2 x \\ \frac{d}{dx}(\cosh x) &= \sinh x & \frac{d}{dx}(\sech x) &= -\operatorname{sech} x \coth x & \frac{d}{dx}(\coth x) &= -\operatorname{csch}^2 x\end{aligned}$$

### Derivatives of Inverse Hyperbolic Functions

$$\begin{aligned}\frac{d}{dx}(\sinh^{-1}x) &= \frac{1}{\sqrt{1+x^2}} & \frac{d}{dx}(\cosh^{-1}x) &= -\frac{1}{|x|\sqrt{x^2+1}} \\ \frac{d}{dx}(\cosh^{-1}x) &= \frac{1}{\sqrt{x^2-1}} & \frac{d}{dx}(\sech^{-1}x) &= -\frac{1}{x\sqrt{1-x^2}} \\ \frac{d}{dx}(\tanh^{-1}x) &= \frac{1}{1-x^2} & \frac{d}{dx}(\coth^{-1}x) &= \frac{1}{1-x^2}\end{aligned}$$

### Hyperbolic Identities

$$\begin{aligned}\sinh(-x) &= -\sinh x & \cosh^2 x - \sinh^2 x &= 1 \\ \cosh(-x) &= \cosh x & 1 - \tanh^2 x &= \operatorname{sech}^2 x\end{aligned}$$

$$\sinh(x+y) = \sinh x \cosh y + \cosh x \sinh y$$

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$$\int \tan(x) dx = \ln|\sec(x)| + C$$

### Weird Inverse Hyperbolic Identities

$$\sinh^{-1} x = \ln(x + \sqrt{x^2 + 1}) \quad x \in \mathbb{R}$$

$$\cosh^{-1} x = \ln(x + \sqrt{x^2 - 1}) \quad x \geq 1$$

$$\tanh^{-1} x = \frac{1}{2} \ln\left(\frac{1+x}{1-x}\right) \quad -1 < x < 1$$

Integration by parts :

$$\int u dv = uv - \int v du$$