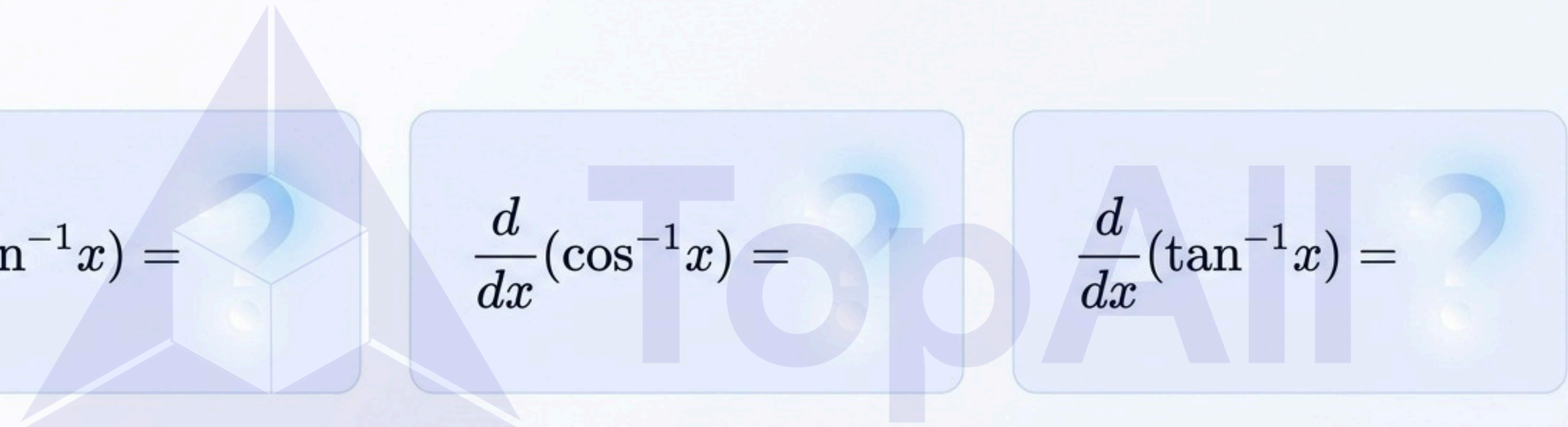


Inverse Trigonometric Derivatives

Formula, sign and valid domain all matter


$$\frac{d}{dx}(\sin^{-1}x) =$$

$$\frac{d}{dx}(\cos^{-1}x) =$$

$$\frac{d}{dx}(\tan^{-1}x) =$$

Inverse $\neq$ Reciprocal

$$\sin^{-1} x$$

Inverse sine
(Represents an angle)



$$\frac{1}{\sin x} (\sin x)^{-1}$$

Reciprocal of sine
(Represents a ratio)

Start From the Inverse Relation

$$y = \sin^{-1} x$$

$$x = \sin y$$

Differentiate w.r.t x

$$1 = \cos y \cdot \frac{dy}{dx}$$

$$\frac{dy}{dx} = \frac{1}{\cos y}$$



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$$E=mc^2$$



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Convert $\cos y$ Into x

Identity Box

$$\cos^2 y = 1 - \sin^2 y$$

Condition Box

$$\text{Since: } \sin y = x$$

$$\text{Therefore: } \cos y = \sqrt{1 - x^2}$$

$$\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1 - x^2}}$$

Valid for: $-1 < x < 1$

Core Formula Set

$$\sin^{-1} x$$

$$\frac{1}{\sqrt{1-x^2}}$$

$$\cos^{-1} x$$

$$-\frac{1}{\sqrt{1-x^2}}$$

$$\tan^{-1} x$$

$$\frac{1}{1+x^2}$$

Memorise Formula + Domain Together



$$\frac{d}{dx} \frac{(\sin^{-1} x)}{\sqrt{1-x^2}} \rightarrow (-1 < x < 1)$$

$$\frac{d}{dx} \frac{(\cos^{-1} x)}{\sqrt{1-x^2}} \rightarrow (-1 < x < 1)$$

$$\frac{d}{dx} (\tan^{-1} x) \rightarrow (x \in \mathbb{R})$$

If $x = \pm 1$, the denominator $\sqrt{1-x^2}$ becomes exactly 0. Division by zero is undefined!

Fast Recall Pattern

$$\sin^{-1} x \rightarrow + \frac{1}{\sqrt{1-x^2}}$$

$$\cos^{-1} x \rightarrow - \frac{1}{\sqrt{1-x^2}}$$

$$\tan^{-1} x \rightarrow + \frac{1}{1+x^2}$$

Traps & Checks



Do not confuse inverse ($\sin^{-1} x$) with reciprocal ($\frac{1}{\sin x}$).



Do not forget the minus sign for $\cos^{-1} x$.



Do not ignore the domain ($-1 < x < 1$ for sine/cosine). Denominators cannot vanish.



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