

# Notes - 5.6 Inverse Trigonometric Functions: Differentiation

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January 2024

## 1 arcsin refresher

$$\sin \theta = \frac{opp}{hyp} \quad (1)$$

$$\arcsin \left( \frac{opp}{hyp} \right) = \sin^{-1} \left( \frac{opp}{hyp} \right) = \theta \quad (2)$$

$$\tan^{-1} \left( \frac{opp}{adj} \right) = \theta \quad (3)$$

$$(4)$$

## 2 Inverse trig functions

$$\cos(\arctan(2x^2)) = \frac{1}{\sqrt{1+4x^4}}, \quad opp = 2x^2, \quad adj = 1, \quad hyp = \sqrt{1^2 + (2x^2)^2} \quad (1)$$

$$\cos \theta = \frac{1}{\sqrt{1+4x^4}} \quad (2)$$

$$\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}} \quad (3)$$

$$\sin y = \sin(\arcsin x) \quad (4)$$

$$\frac{d}{dx}(\sin y = x) \quad (5)$$

$$\cos y dy = dx \quad (6)$$

$$\frac{dy}{dx} = \frac{1}{\cos y} \quad (7)$$

$$\frac{d}{dx}(\cos^{-1} x) = , \quad opp = \sqrt{1^2 - x^2}, \quad adj = x, \quad hyp = 1 \quad (1)$$

$$\cos y = \cos(\cos^{-1} x) \quad (2)$$

$$\cos y = x \quad (3)$$

$$-\sin y dy = dx \quad (4)$$

$$\frac{dy}{dx} = -\frac{1}{\sin y} \quad (5)$$

$$\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}, \text{ opp} = x, \text{ adj} = 1, \text{ hyp} = \sqrt{1^2 + x^2} \quad (1)$$

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

$$\tan y = x \quad (3)$$

$$\sec^2 y dx = dx \quad (4)$$

$$\frac{dy}{dx} = \frac{1}{\sec^2 y} = \frac{1}{(\sec y)^2} = \frac{1}{(\sqrt{1+x^2})^2} \quad (5)$$

$$\frac{d}{dx}(\sec^{-1} x) =, \text{ opp} = \sqrt{x^2 - 1^2}, \text{ adj} = 1, \text{ hyp} = x \quad (1)$$

$$\sec y = \frac{x}{1} = x \quad (2)$$

$$\sec y \tan y dy = dx \quad (3)$$

$$\frac{dy}{dx} = \frac{1}{\sec y \tan y} \quad (4)$$