

Properties of Inverse trigonometric functions

$$\textcircled{1} \text{ i) } \sin^{-1} \frac{1}{x} = \operatorname{cosec}^{-1} x, \quad x > 1 \text{ \& } x \leq -1$$

$$\text{ii) } \cos^{-1} \frac{1}{x} = \sec^{-1} x, \quad x > 1 \text{ \& } x \leq -1.$$

$$\text{iii) } \tan^{-1} \frac{1}{x} = \operatorname{cot}^{-1} x, \quad x > 0$$

$$\textcircled{2} \text{ i) } \sin^{-1}(-x) = -\sin^{-1} x, \quad x \in [-1, 1]$$

$$\text{ii) } \tan^{-1}(-x) = -\tan^{-1} x, \quad x \in \mathbb{R}$$

$$\text{iii) } \operatorname{cosec}^{-1}(-x) = -\operatorname{cosec}^{-1} x, \quad |x| > 1$$

$$\textcircled{3} \text{ i) } \cos^{-1}(-x) = \pi - \cos^{-1} x, \quad x \in [-1, 1]$$

$$\text{ii) } \sec^{-1}(-x) = \pi - \sec^{-1} x, \quad |x| > 1$$

$$\textcircled{4} \text{ i) } \sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}, \quad x \in [-1, 1]$$

$$\text{ii) } \tan^{-1} x + \operatorname{cot}^{-1} x = \frac{\pi}{2}, \quad x \in \mathbb{R}$$

$$\text{iii) } \operatorname{cosec}^{-1} x + \sec^{-1} x = \frac{\pi}{2}, \quad |x| > 1$$

$$\textcircled{5} \text{ i) } \tan^{-1} x + \tan^{-1} y = \tan^{-1} \frac{x+y}{1-xy}, \quad xy < 1$$

$$\text{ii) } \tan^{-1} x - \tan^{-1} y = \tan^{-1} \frac{x-y}{1+xy}, \quad xy < -1$$

$$\text{iii) } 2 \tan^{-1} x = \tan^{-1} \frac{2x}{1-x^2}, \quad |x| < 1$$

$$(6) \text{ i) } 2 \tan^{-1} x = \sin^{-1} \frac{2x}{1+x^2}, \quad |x| \leq 1$$

$$\text{ii) } 2 \tan^{-1} x = \cos^{-1} \frac{1-x^2}{1+x^2}, \quad x > 0$$

$$\text{iii) } 2 \tan^{-1} x = \tan^{-1} \frac{2x}{1-x^2}, \quad -1 < x < 1.$$

$$(7) 3 \sin \theta - 4 \sin^3 \theta = \sin 3\theta$$

$$(8) \cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$$

$$(9) \boxed{1 - \cos \theta = 2 \sin^2 \frac{\theta}{2}}$$

$$(10) \boxed{1 + \cos \theta = 2 \cos^2 \frac{\theta}{2}}$$

$$(11) \sin \theta = 2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$$

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

$$x = \cos y.$$

$$x = \frac{1}{\sin y}$$

$$\sin y = \frac{1}{x}$$

$$y = \sin^{-1} \left(\frac{1}{x} \right)$$

$$\boxed{\cos^{-1} x = \sin^{-1} \left(\frac{1}{x} \right)}$$