Chapter 2 Inverse Trigonometric Functions Formulas

Those Notes are written by Mount Institute of Maths .

The domains and ranges of Inverse Trigonometric (or Inverse Circular) functions are :-

Function	Domain	Range
$\sin^{-1} x$	[-1,1]	$[-\frac{\pi}{2}, \frac{\pi}{2}]$
$\cos^{-1} x$	[-1,1]	[0 , π]
$\tan^{-1} x$	[x : x = (2n+1)$\frac{\pi}{2}$, n ε Z]	$[-\frac{\pi}{2}, \frac{\pi}{2}]$
$\cot^{-1} x$	[x : x = nπ, n ε Z]	[0 , π]
$\sec^{-1} x$	[x : x = (2n+1)$\frac{\pi}{2}$, n ε Z] or [-1,1]	[0 , π] $-\frac{\pi}{2}$
$\operatorname{cosec}^{-1} x$	[x : x = nπ, n ε Z] or [-1,1]	$[-\frac{\pi}{2}, \frac{\pi}{2}]$

❖ Some Important Results:

- $\sin^{-1}(-x) = -\sin^{-1} x$
- $\tan^{-1}(-x) = -\tan^{-1}(x)$
- $\operatorname{cosec}^{-1}(-x) = -\csc^{-1}(x)$
- $\cos^{-1}(-x) = \pi - \cos^{-1}(x)$
- $\cot^{-1}(-x) = \pi - \cot^{-1}(x)$
- $\sec^{-1}(-x) = \pi - \sec^{-1}(x)$

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- $\sin^{-1} x = \frac{1}{\csc^{-1} x}$
- $\cos^{-1} x = \frac{1}{\sec^{-1} x}$
- $\tan^{-1} x = \frac{1}{\cot^{-1} x}$
- $\cot^{-1} x = \frac{1}{\tan^{-1} x}$
- $\sec^{-1} x = \frac{1}{\cos^{-1} x}$
- $\operatorname{cosec}^{-1} x = \frac{1}{\sin^{-1} x}$

❖ 1

➢ $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$

▪ $\cos^{-1} x = \frac{\pi}{2} - \sin^{-1} x$

▪ $\sin^{-1} x = \frac{\pi}{2} - \cos^{-1} x$

➢ $\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$

▪ $\cot^{-1} x = \frac{\pi}{2} - \tan^{-1} x$

▪ $\tan^{-1} x = \frac{\pi}{2} - \cot^{-1} x$

➢ $\operatorname{cosec}^{-1} x + \sec^{-1} x = \frac{\pi}{2}$

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- $\text{cosec}^{-1}\, x = \frac{\pi}{2} - \sec^{-1} x$
- $\sec^{-1} x = \frac{\pi}{2} - \text{cosec}^{-1}\, x$

❖ 2

- $\tan^{-1} x + \tan^{-1} x = \tan^{-1}(\frac{x+y}{1-xy})$
- $\tan^{-1} x - \tan^{-1} x = \tan^{-1}(\frac{x-y}{1+xy})$

❖ 6

- $2\tan^{-1} x = \sin^{-1}(\frac{2x}{1+x^2})$
- $2\tan^{-1} x = \cos^{-1}(\frac{1-x^2}{1+x^2})$
- $2\tan^{-1} x = \tan^{-1}(\frac{2x}{1-x^2})$
- $2\sin^{-1} x = \sin^{-1} 2x\sqrt{1-x^2})$
- $2\cos^{-1} x = \cos^{-1} 2x\sqrt{1-x^2})$