Maths Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

Unlock the full PadhoNa Test Series
Every chapter-wise JEE Main test on the real exam screen, with full solutions and automatic analysis. Plans from ₹99 a month.
padhona.com/go/test-series →

CHAPTER 11

Inverse Trigonometric Functions

Domains and principal ranges

$$\sin^{-1}x:\ [-1,1]\to\left[-\frac{\pi}{2},\frac{\pi}{2}\right],\qquad \cos^{-1}x:\ [-1,1]\to[0,\pi]$$

$$\tan^{-1}x:\ \mathbb{R}\to\left(-\frac{\pi}{2},\frac{\pi}{2}\right),\qquad \cot^{-1}x:\ \mathbb{R}\to(0,\pi)$$

$$\sec^{-1}x:\ |x|\geq 1\to[0,\pi]\setminus\{\tfrac{\pi}{2}\},\qquad \csc^{-1}x:\ |x|\geq 1\to\left[-\tfrac{\pi}{2},\tfrac{\pi}{2}\right]\setminus\{0\}$$

Properties

COMPLEMENTARY

$$\sin^{-1}x+\cos^{-1}x=\frac{\pi}{2},\qquad \tan^{-1}x+\cot^{-1}x=\frac{\pi}{2},\qquad \sec^{-1}x+\csc^{-1}x=\frac{\pi}{2}$$

NEGATIVE ARGUMENTS

$$\sin^{-1}(-x)=-\sin^{-1}x,\qquad \tan^{-1}(-x)=-\tan^{-1}x,\qquad \cos^{-1}(-x)=\pi-\cos^{-1}x,$$
$$\cot^{-1}(-x)=\pi-\cot^{-1}x$$

RECIPROCAL

$$\csc^{-1}x=\sin^{-1}\frac{1}{x},\qquad \sec^{-1}x=\cos^{-1}\frac{1}{x},\qquad \cot^{-1}x=\tan^{-1}\frac{1}{x}\ (x>0)$$

COMPOSITIONS

$$\sin(\sin^{-1}x)=x\ (|x|\leq 1);\qquad \sin^{-1}(\sin x)=x \text{ only for } x\in\left[-\tfrac{\pi}{2},\tfrac{\pi}{2}\right]$$

Sum and difference

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

If $xy>1$ and $x,y>0$, add π.

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

DOUBLE

$$2\tan^{-1} x = \tan^{-1} \frac{2x}{1-x^2} = \sin^{-1} \frac{2x}{1+x^2} = \cos^{-1} \frac{1-x^2}{1+x^2} \quad (0 \le x < 1)$$

For $-1 < x < 0$ the first two still hold; the $\cos^{-1}$ form becomes $-\cos^{-1} \frac{1-x^2}{1+x^2}$.

TELESCOPING

$$\tan^{-1} \frac{a_{k+1} - a_k}{1 + a_k a_{k+1}} = \tan^{-1} a_{k+1} - \tan^{-1} a_k$$

Write the general term this way to sum series of $\tan^{-1}$ terms.

Unlock the full PadhoNa Test Series

Every chapter-wise JEE Main test on the real exam screen, with full solutions and automatic analysis. Plans from ₹99 a month.

padhona.com/go/test-series →

Keep going with PadhoNa

Unlock the full PadhoNa Test Series

Every chapter-wise JEE Main test on the real exam screen, with full solutions and automatic analysis. Plans from ₹99 a month.

padhona.com/go/test-series →

PadhoNa Pro Maths notes

Complete, exam-focused Maths notes by the PadhoNa team: ₹99 for a year.

padhona.com/go/notes/maths →

Physics, Chemistry and Maths notes together

PadhoNa Pro · JEE: all three subjects for ₹249 a year, for JEE Main and Advanced.

padhona.com/go/pro →

© PadhoNa · padhona.com · This sheet is for personal study.