12th Board SPRINT

With TRICKS

INVERSE TRIGONOMETRY

COMPLETE REVISION

NEHA MA'AM'S ARMY

WORK 4 U!

Let the MAGIC BEGIN !!

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TELEGRAM CONTEST

- JOIN US ON TELEGRAM TO PARTICIPATE & WIN THE FOLLOWING T-SHIRTS EVERY WEEK.
- CHOOSE YOUR DESIGN & LET US KNOW.
- WINNERS WOULD BE CHOSEN FROM THE TELEGRAM GROUP.

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se.... Thank you Members !!

S.No	Name	Total Time as Member months
1	Yogesh Kumar Pandey	19
2	Deepa Thulasiram	18
3	B Neelima	15
4	Ch. Harsha Vardhan Reddy	12
5	Siri Akshita	10
6	Ivana Polednova	7
7	Rajesh George	7
8	Sucha Singh	7
9	Vinod Sir	6
10	Ram Kumar	6
11	Mohan Kumar	6

S.No	Name	Total Time as Member
12	Asit Kumar Jena	6
13	Chhoteylal Mehta	5
14	Raghunath Saxsena	4
15	Arjun SI	3
16	Aradhana Ambre	2
17	JV RAMA KRISHNA	2
18	Simon Raaz	1
19	Raghuram Rao	1
20	Puneet Kapoor	1
21	Anjana Balagopal	1
22	Maahi Singh	1
23	Gaurav Kumar	1

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TELEGRAM Contest 3 is OPEN till 11th Dec 9 p.m. !!

T Shirts to be won

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INVERSE OF A FUNCTION

Corresponding to every bijection, $f : A \to B$;

there exists another bijection;

$g : B \to A$; defined by $g(y) = x$ if and only if $f(x) = y$

$g : B \to A$ is called inverse of $f : A \to B$ and is denoted by f^{-1}.

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Function	Domain	Range
$\sin^{-1}$	[-1, 1]	$[-\pi/2, \pi/2]$
$\cos^{-1}$	[-1, 1]	$[0, \pi]$
$\tan^{-1}$	R	$(-\pi/2, \pi/2)$
$\cot^{-1}$	R	$(0, \pi)$
$\sec^{-1}$	R - (-1, 1)	$[0, \pi] - \{\pi/2\}$
$\operatorname{cosec}^{-1}$	R - (-1, 1)	$[-\pi/2, \pi/2] - \{0\}$

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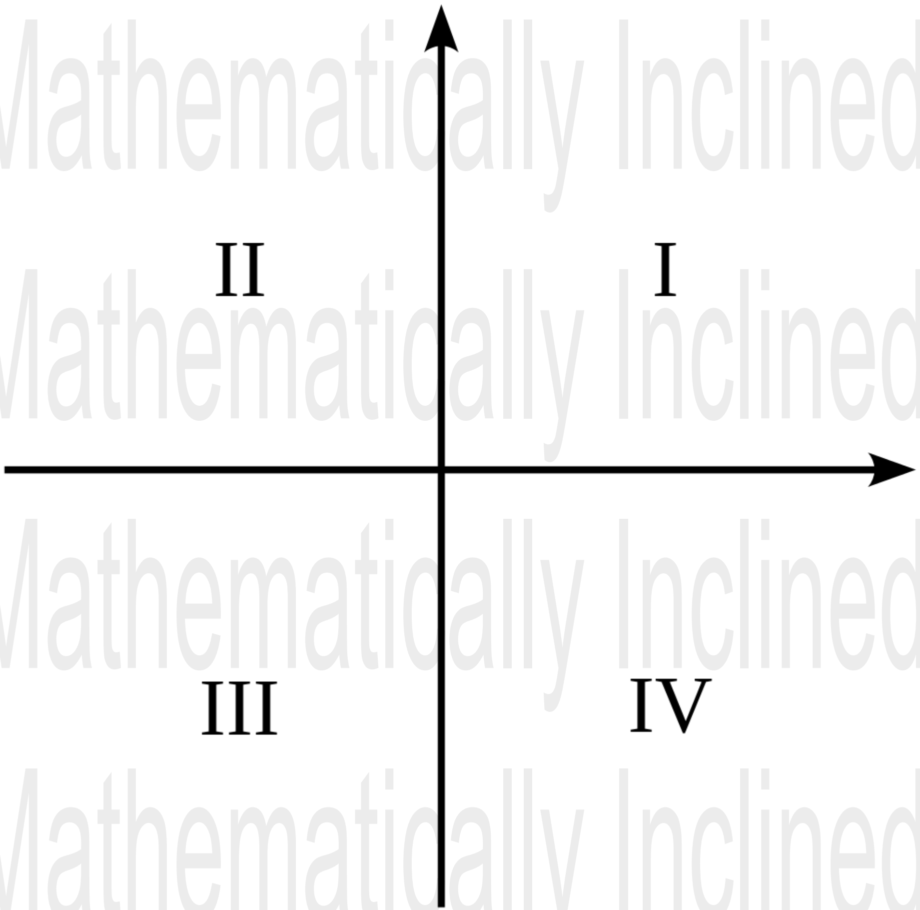

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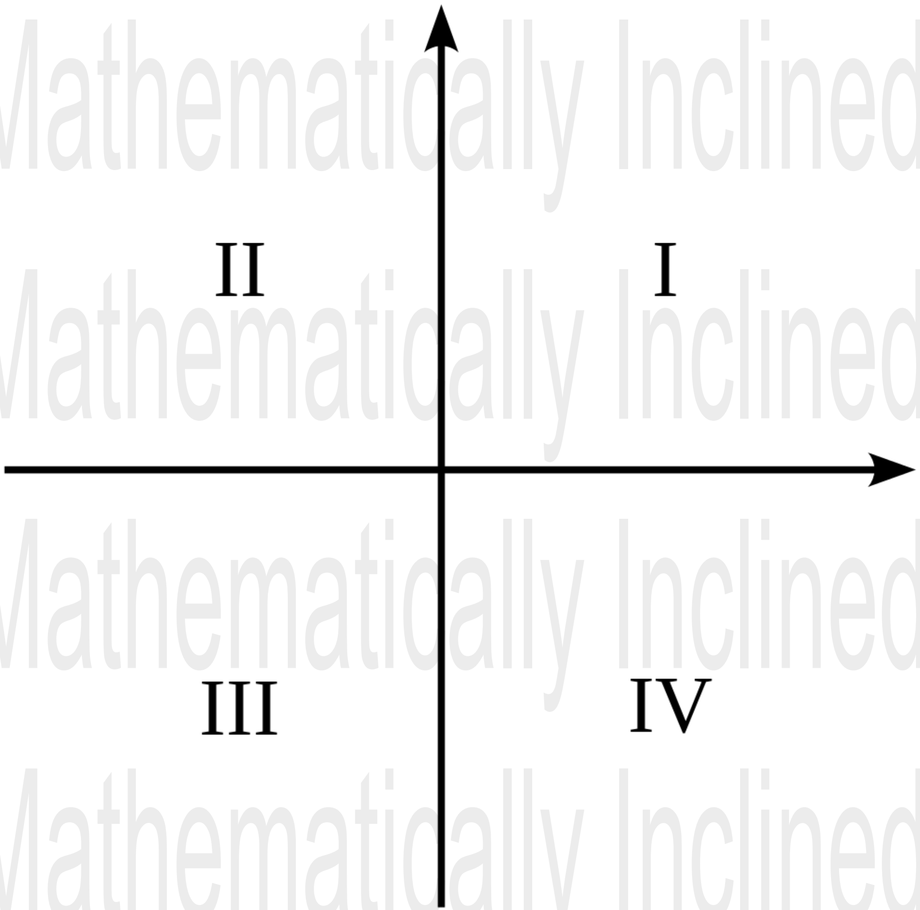

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Function	Domain	Range
$\sin^{-1}$	[-1, 1]	[-π/2, π/2]
$\cos^{-1}$	[-1, 1]	[0, π]
$\tan^{-1}$	R	(-π/2, π/2)
$\cot^{-1}$	R	(0, π)
$\sec^{-1}$	R - (-1, 1)	[0, π] - {π/2}
cosec^{-1}	R - (-1, 1)	[-π/2, π/2] - {0}

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$$\sin^{-1}(\sin\theta)=\theta,\ \text{Provided that } -\frac{\pi}{2}\le\theta\le\frac{\pi}{2},$$

$$\cos^{-1}(\cos\theta)=\theta,\ \text{Provided that } 0\le\theta\le\pi$$

$$\tan^{-1}(\tan\theta)=\theta,\ \text{Provided that } -\frac{\pi}{2}<\theta<\frac{\pi}{2},$$

$$\cot^{-1}(\cot\theta)=\theta,\ \text{Provided that } 0<\theta<\pi$$

$$\sec^{-1}(\sec\theta)=\theta,\ \text{Provided that } 0\le\theta<\frac{\pi}{2} \text{ or } \frac{\pi}{2}<\theta\le\pi$$

$$\operatorname{cosec}^{-1}(\operatorname{cosec}\theta)=\theta,\ \text{Provided that } -\frac{\pi}{2}\le\theta<0 \text{ or } 0<\theta\le\frac{\pi}{2}$$

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$\sin(\sin^{-1} x) = x$, Provided that $-1 \leq x \leq 1$,

$\cos(\cos^{-1} x) = x$, Provided that $-1 \leq x \leq 1$

$\tan(\tan^{-1} x) = x$, Provided that $-\infty < x < \infty$

$\cot(\cot^{-1} x) = x$, Provided that $-\infty < x < \infty$

$\sec(\sec^{-1} x) = x$, Provided that $-\infty < x \leq -1$ or $1 \leq x < \infty$

$\operatorname{cosec}(\operatorname{cosec}^{-1} x) = x$, Provided that $-\infty < x \leq -1$ or $1 \leq x < \infty$

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(i) $\sin^{-1}(-x) = -\sin^{-1}x$, $\cos^{-1}(-x) = \pi - \cos^{-1}x$

(ii) $\tan^{-1}(-x) = -\tan^{-1}x$, $\cot^{-1}(-x) = \pi - \cot^{-1}x$

(iii) $\operatorname{cosec}^{-1}(-x) = -\operatorname{cosec}^{-1}x$ $\sec^{-1}(-x) = \pi - \sec^{-1}x$,

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$$\begin{cases} \sin^{-1} x + \cos^{-1} x = \dfrac{\pi}{2}, & \text{for all } x \in [-1, 1] \\ \tan^{-1} x + \cot^{-1} x = \dfrac{\pi}{2}, & \text{for all } x \in R \\ \sec^{-1} x + \operatorname{cosec}^{-1} x = \dfrac{\pi}{2}, & \text{for all } x \in (-\infty, -1] \cup [1, \infty) \end{cases}$$

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

$$\tan^{-1}x - \tan^{-1}y = \tan^{-1}\frac{x-y}{1+xy},\ xy > -1$$

$$\tan^{-1}x + \tan^{-1}y = \pi + \tan^{-1}\left(\frac{x+y}{1-xy}\right),\ xy > 1;\ x,\ y > 0$$

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$$2\tan^{-1}x = \tan^{-1}\left(\frac{2x}{1-x^2}\right), \qquad If\ -1 < x < 1$$

$$2\tan^{-1}x = \sin^{-1}\left(\frac{2x}{1+x^2}\right), \qquad If\ -1 \le x \le 1$$

$$2\tan^{-1}x = \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right), \qquad If\, 0 \le x$$

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$$\begin{cases} \sin^{-1}x+\sin^{-1}y=\sin^{-1}\left\{x\sqrt{1-y^2}+y\sqrt{1-x^2}\right\}; & x\ge 0,\ y\ge 0 \text{ and } x^2+y^2\le 1 \\ \sin^{-1}x+\sin^{-1}y=\pi-\sin^{-1}\left\{x\sqrt{1-y^2}+y\sqrt{1-x^2}\right\}; & x\ge 0,\ y\ge 0 \text{ and } x^2+y^2\ge 1 \end{cases}$$

$$\sin^{-1}x-\sin^{-1}y=\sin^{-1}\left\{x\sqrt{1-y^2}-y\sqrt{1-x^2}\right\}; \qquad x\ge 0,\ y\ge 0$$

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$$\cos^{-1}x+\cos^{-1}y=\cos^{-1}\left\{xy-\sqrt{1-x^2}\sqrt{1-y^2}\right\}; \qquad x\ge 0,\ y\ge 0$$

$$\begin{cases}\cos^{-1}x-\cos^{-1}y=\cos^{-1}\left\{xy+\sqrt{1-x^2}\sqrt{1-y^2}\right\}; & x\ge 0,\ y\ge 0,\ x\le y\\ \cos^{-1}x-\cos^{-1}y=-\cos^{-1}\left\{xy+\sqrt{1-x^2}\sqrt{1-y^2}\right\}; & x\ge 0,\ y\ge 0,\ x\ge y\end{cases}$$

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QUESTIONS

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CBSE Sample Paper 2021 - 2 marks

Q1. Express $\tan^{-1}\left(\dfrac{\cos x}{1-\sin x}\right), \dfrac{-3\pi}{2} < x < \dfrac{\pi}{2}$ in the simplest form.

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Solution:

$$\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right) = \tan^{-1}\left[\frac{\sin\left(\frac{\pi}{2}-x\right)}{1-\cos\left(\frac{\pi}{2}-x\right)}\right]$$

$$\tan^{-1}\left[\frac{2\sin\left(\frac{\pi}{4}-\frac{x}{2}\right)\cos\left(\frac{\pi}{4}-\frac{x}{2}\right)}{2\sin^2\left(\frac{\pi}{4}-\frac{x}{2}\right)}\right]$$

$$\tan^{-1}\left[\cot\left(\frac{\pi}{4}-\frac{x}{2}\right)\right] = \tan^{-1}\left[\tan\frac{\pi}{2}-\left(\frac{\pi}{4}-\frac{x}{2}\right)\right]$$

$$\tan^{-1}\left[\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)\right] = \frac{\pi}{4}+\frac{x}{2}$$

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CBSE Sample Paper 2018 - 1 mark

Q2. Find the value of $\tan^{-1}\left(\sqrt{3}\right) - \cot^{-1}\left(-\sqrt{3}\right)$

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Solution:

$$\tan^{-1}\left(\sqrt{3}\right)-\cot^{-1}\left(-\sqrt{3}\right)$$

$$=\frac{\pi}{3}-\frac{5\pi}{6}$$

$$=\frac{2\pi-5\pi}{6}$$

$$=\frac{-3\pi}{6}$$

$$=\frac{-\pi}{2}$$

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CBSE Sample Paper 2020 - 2 mark

Q3. Express $\sin^{-1}\left(\frac{\sin x + \cos x}{\sqrt{2}}\right)$; where $-\frac{\pi}{4} < x < \frac{\pi}{4}$, in the simplest form.

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Solution:

$$= \sin^{-1}\left(\frac{\sin x}{\sqrt{2}} + \frac{\cos x}{\sqrt{2}}\right) \text{ if } -\frac{\pi}{4} < x < \frac{\pi}{4}$$

$$= \sin^{-1}\left(\sin x \cos\frac{\pi}{4} + \cos x \sin\frac{\pi}{4}\right)$$

$$\text{if } -\frac{\pi}{4} + \frac{\pi}{4} < x + \frac{\pi}{4} < \frac{\pi}{4} + \frac{\pi}{4}$$

$$= \sin^{-1}\left(\sin\left(x + \frac{\pi}{4}\right)\right) \; if \; 0 < \left(x + \frac{\pi}{4}\right)$$

$$< \frac{\pi}{2} \; i.e. \text{ principal values}$$

$$= \left(x + \frac{\pi}{4}\right)$$