★ CHAPTER-2 :- ITF ★

○ Principle Values - Domain and Range :

	Domain	Range
① $\sin^{-1}x$	$[-1,1]$	$[-\pi/2, \pi/2]$
② $\cos^{-1}x$	$[-1,1]$	$[0,\pi]$
③ $\tan^{-1}x$	$(-\infty,\infty)$	$(-\pi/2, \pi/2)$

○ Identities :

→ Type I [Reciprocal Identity] ✓

① $\sin^{-1}(1/x) = \operatorname{cosec}^{-1}x$

② $\cos^{-1}(1/x) = \sec^{-1}x$

③ $\tan^{-1}(1/x) = \cot^{-1}x$

④ $\sec^{-1}(1/x) = \cos^{-1}x$

⑤ $\cot^{-1}(1/x) = \tan^{-1}x$

⑥ $\operatorname{cosec}^{-1}(1/x) = \sin^{-1}x$.

→ Type II [negative angle Identity]

① $\sin^{-1}(-\theta) = -\sin\theta$

② $\cos^{-1}(-\theta) = \pi - \cos\theta$

③ $\tan^{-1}(-\theta) = -\tan\theta$

④ $\cot^{-1}(-\theta) = \pi - \cot\theta$

⑤ $\sec^{-1}(-\theta) = \pi - \sec\theta$

⑥ $\operatorname{cosec}^{-1}(-\theta) = -\operatorname{cosec}\theta$

→ Type III

① $\sin^{-1}x + \cos^{-1}x = \pi/2$

② $\cot^{-1}x + \tan^{-1}x = \pi/2$

③ $\sec^{-1}x + \operatorname{cosec}^{-1}x = \pi/2$.

→ $x\sqrt{1-x^2}$ → cos/sin
↓
sin/cos

② $2\tan^{-1}x = \sin^{-1}\left[\frac{2x}{1+x^2}\right]$

$= \cos^{-1}\left[\frac{1-x^2}{1+x^2}\right]$

$= \tan^{-1}\left[\frac{2x}{1-x^2}\right]$

→ Type IV

① $2\sin^{-1}x = 2\cos^{-1}x = \sin^{-1}\left[2x\sqrt{1-x^2}\right]$

② $3\sin^{-1}x = \sin^{-1}\left[3x-4x^3\right]$

③ $3\cos^{-1}x = \cos^{-1}\left[4x^3-3x\right]$

⑤ $3\tan^{-1}x = \tan^{-1}\left[\frac{3x-x^3}{1-3x^2}\right]$

→ Type V

① $\sin^{-1}x + \sin^{-1}y = \sin^{-1}\left[x\sqrt{1-y^2} + y\sqrt{1-x^2}\right]$

② $\cos^{-1}x + \cos^{-1}y = \cos^{-1}\left[xy - \sqrt{1-x^2}\sqrt{1-y^2}\right]$

③ $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left[\frac{x+y}{1-xy}\right]$

○ Substitutions : Root हटाने के तरीके -

① $\sqrt{1-x^2} = x \to \sin/\cos$.

② $\sqrt{x^2-1} = x \to \sec/\operatorname{cosec}$

③ $\sqrt{1+x^2} = x \to \tan/\cot$

○ Brahmastra :

$1-\cos 2x = 2\sin^2 x$

$1+\cos 2x = 2\cos^2 x$.

Radian / Degree :

① $R = \frac{\pi}{180} \times D$

② $D = \frac{180}{\pi} \times R$

11th →

① $\cos 2\theta = \cos^2\theta - \sin^2\theta$

$= 2\cos^2\theta - 1$

$= 1 - 2\sin^2\theta$

$= \frac{1-\tan^2\theta}{1+\tan^2\theta}$

② $\sin^2\theta + \cos^2\theta = 1$

$\sec^2\theta - \tan^2\theta = 1$

$\operatorname{cosec}^2\theta - \cot^2\theta = 1$

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