

$$\frac{\pi}{\pi} \cdot \frac{\pi}{\pi} \cdot \frac{\pi}{\pi} \cdot \frac{\pi}{\pi} \cdot \frac{\pi}{\pi}$$

$$\Rightarrow \tan^{-1} \tan \theta$$

$$\Rightarrow \theta \Rightarrow \underline{\tan^{-1} \operatorname{cosec}^{-1} x} \text{ Ans}$$

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$$\tan^{-1} \left(\sqrt{\frac{1 - \cos x}{1 + \cos x}} \right), \quad x < \pi$$

$$\Rightarrow \tan^{-1} \left(\sqrt{\frac{2 \sin^2 \frac{x}{2}}{2 \cos^2 \frac{x}{2}}} \right)$$

$$\Rightarrow \tan^{-1} \left(\sqrt{\frac{\sin^2 \frac{x}{2}}{\cos^2 \frac{x}{2}}} \right)$$

$$\Rightarrow \tan^{-1} \left(\sqrt{\tan^2 \frac{x}{2}} \right)$$

$$\Rightarrow \tan^{-1} \tan \frac{x}{2} \Rightarrow \frac{x}{2} \text{ Ans}$$

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$$\tan^{-1} \left(\frac{\cos x - \sin x}{\cos x + \sin x} \right), \quad x < \pi$$

2)

On dividing $\cos x$, we get

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

$$\Rightarrow \tan^{-1} \left(\frac{1 - \tan x}{1 + \tan x} \right)$$

$$\Rightarrow \tan^{-1} \left(\frac{\tan \frac{\pi}{4} - \tan x}{\tan \frac{\pi}{4} + \tan x \cdot \tan \frac{\pi}{4}} \right)$$

$$\Rightarrow x = \tan \frac{\pi}{4} \quad y = \tan x.$$

$$\Rightarrow \tan^{-1} \tan \frac{\pi}{4} - \tan^{-1} \tan x$$

$$\Rightarrow \boxed{\frac{\pi}{4} - x} \quad \text{Ans}$$

$$\textcircled{9} \quad \tan^{-1} \frac{x}{\sqrt{a^2 - x^2}}, \quad |x| < a.$$

$$\Rightarrow x = a \sin \theta$$

$$\theta = \sin^{-1} \frac{x}{a}$$

$$\Rightarrow \tan^{-1} \left(\frac{a \sin \theta}{\sqrt{a^2 - a^2 \sin^2 \theta}} \right)$$

$$\Rightarrow \tan^{-1} \left(\frac{a \sin \theta}{\sqrt{a^2 (1 - \sin^2 \theta)}} \right)$$

$$\Rightarrow \tan^{-1} \left(\frac{a \sin \theta}{a \sqrt{\cos^2 \theta}} \right)$$

$$\Rightarrow \tan^{-1} \left(\frac{\cancel{a} \sin \theta}{\cancel{a} \cos \theta} \right)$$

$$\Rightarrow \tan^{-1} \tan \theta$$

$$\Rightarrow \theta = \boxed{\sin^{-1} \frac{x}{a}} \quad \text{Ans}$$

$$(10) \tan^{-1} \left(\frac{3a^2 x - x^3}{a^3 - 3ax^2} \right), a > 0; -\frac{a}{\sqrt{3}} < x < \frac{a}{\sqrt{3}}$$

$$\Rightarrow \tan^{-1} \left(\frac{3a^2 x - x^3}{a^3 - 3ax^2} \right)$$

$$\Rightarrow x = a \sin \theta$$

$$\theta = \sin^{-1} \frac{x}{a}$$

$$\Rightarrow \tan^{-1} \left(\frac{3a^2 a \sin \theta - a^3 \sin^3 \theta}{a^3 - 3a a^2 \sin^2 \theta} \right)$$

$$\Rightarrow \tan^{-1} \left(\frac{3a^2 a \sin \theta - a^3 \sin^3 \theta}{a \cos^2 \theta} \right)$$

$$\boxed{3 \tan^{-1} \frac{x}{a}} \quad \text{Ans} \\ ??$$

~~$$\Rightarrow \tan^{-1} \left(\frac{a^3 (3 \sin \theta - \sin^3 \theta)}{a \cos^2 \theta} \right)$$~~

$$\Rightarrow \tan^{-1} \left(\frac{a^3 \sin \theta (3 \times 1 - \sin^2 \theta)}{a \cos^2 \theta} \right)$$

$$\Rightarrow \tan^{-1} \left(\frac{a^3 \sin \theta \times 3 \cos^2 \theta}{a \cos^2 \theta} \right)$$

$$\Rightarrow \tan^{-1} a^2 \tan \theta \cdot \sec \theta \cdot 3a$$