

22. Show that  $f(x) = \tan^{-1}(\sin x + \cos x)$  is an increasing function in  $\left(0, \frac{\pi}{4}\right)$

**Sol.** We have,  $f(x) = \tan^{-1}(\sin x + \cos x)$

$$\begin{aligned}\therefore f'(x) &= \frac{1}{1 + (\sin x + \cos x)^2} (\cos x - \sin x) \\ &= \frac{\cos x - \sin x}{1 + (\sin x + \cos x)^2}\end{aligned}$$

For  $x \in \left(0, \frac{\pi}{4}\right)$ ,  $\cos x > \sin x$

$$\therefore f'(x) > 0$$

$\therefore f(x)$  increases in  $\left(0, \frac{\pi}{4}\right)$