

Q.3) If $x > y > z > 0$, then find the value of

$$\cot^{-1}\left(\frac{xy+1}{x-y}\right) + \cot^{-1}\left(\frac{yz+1}{y-z}\right) + \cot^{-1}\left(\frac{zx+1}{z-x}\right)$$

Soln- $\cot^{-1}\left(\frac{xy+1}{x-y}\right) + \cot^{-1}\left(\frac{y-z}{yz+1}\right) + \cot^{-1}\left(\frac{zx+1}{z-x}\right)$

we know that, $\cot^{-1} x = \tan^{-1}\left(\frac{1}{x}\right)$

So,

$$\tan^{-1}\left(\frac{x-y}{1+xy}\right) + \tan^{-1}\left(\frac{y-z}{1+yz}\right) + \tan^{-1}\left(\frac{z-x}{1+xz}\right)$$

$$= (\tan^{-1} x - \tan^{-1} y) + (\tan^{-1} y - \tan^{-1} z) + (\tan^{-1} z - \tan^{-1} x)$$

$$\left[\begin{array}{l} \because \tan^{-1}\left(\frac{a-b}{1+ab}\right) = \tan^{-1} a - \tan^{-1} b \end{array} \right]$$

$$= \underline{\underline{0}}$$