ASSIGNMENT 2 : ICSE 12,2019

AI21BTECH11016

PROBLEM 3-A :

Solve for x :

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

Solution: Applying tan on both sides,

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

$$\frac{\tan\left(\tan^{-1}\left(\frac{x-1}{x-2}\right)\right)+\tan\left(\tan^{-1}\left(\frac{x+1}{x+2}\right)\right)}{1-\tan\left(\tan^{-1}\left(\frac{x-1}{x-2}\right)\right)\tan\left(\tan^{-1}\left(\frac{x+1}{x+2}\right)\right)}=1 \quad (2)$$

$$\boxed{\because \tan(A+B)=\frac{\tan A+\tan B}{1-\tan A\tan B}}$$

$$\Rightarrow \frac{\frac{x-1}{x-2}+\frac{x+1}{x+2}}{1-\frac{x-1}{x-2}\frac{x+1}{x+2}}=1 \quad (3)$$

$$\boxed{\because \tan\left(\tan^{-1}x\right)=x, \forall x\in R}$$

$$\left(\frac{x^2+x-2+x^2-x-2}{x^2-4-x^2+1}\right)=1 \quad (4)$$

$$\left(\frac{2x^2-4}{-3}\right)=1 \quad (5)$$

$$2x^2-4=-3 \quad (6)$$

$$2x^2=4-3=1 \quad (7)$$

$$\Rightarrow \boxed{x=\pm\frac{1}{\sqrt{2}}} \quad (8)$$

$\therefore$ **The solution to the given equation is x =** $\pm\frac{1}{\sqrt{2}}$

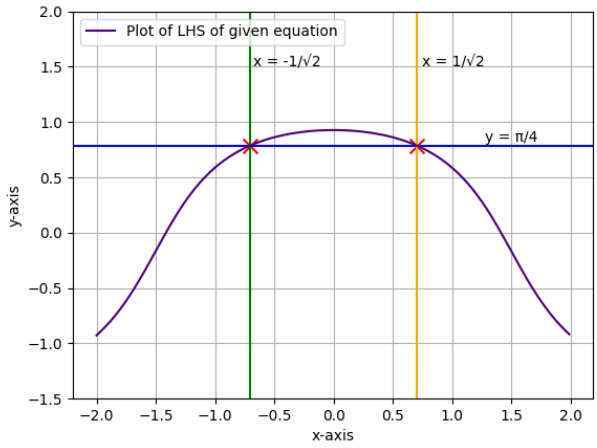

Fig. 1. Graphical representation of solution