**Q1 (20 July 2021 Shift 1)**

The number of real roots of the equation

$\tan^{-1}\sqrt{x(x+1)}+\sin^{-1}\sqrt{x^2+x+1}=\frac{\pi}{4}$ is :

(1) 1

(2) 2

(3) 4

(4) 0

**Q2 (20 July 2021 Shift 2)**

The value of $\tan\left(2\tan^{-1}\left(\frac{3}{5}\right)+\sin^{-1}\left(\frac{5}{13}\right)\right)$ is equal to:

(1) $\frac{-181}{69}$

(2) $\frac{220}{21}$

(3) $\frac{-291}{76}$

(4) $\frac{151}{63}$

# Answer Key

**Q1** (4) **Q2** (2)

**Q1**

$\tan^{-1}\sqrt{x^2+x}+\sin^{-1}\sqrt{x^2+x+1}=\frac{\pi}{4}$

For equation to be defined,

$x^2+x\geq 0$

$\Rightarrow \quad x^2+x+1\geq 1$

$\therefore$ only possibility that the equation is defined

$x^2+x=0 \quad \Rightarrow x=0;x=-1$

None of these values satisfy

$\therefore$ No of roots $=0$

**Q2**

$$\underbrace{\tan^{-1}\frac{3}{5}+\tan^{-1}\frac{3}{5}}_{x>0,y>0,xy<1}+\tan^{-1}\frac{5}{12}$$

$$\tan^{-1}\frac{\frac{6}{5}}{1-\frac{9}{25}}=\underbrace{\tan^{-1}\frac{15}{8}+\tan^{-1}\frac{5}{12}}_{x>0,y>0,xy<1}$$

$$\tan^{-1}\frac{\frac{15}{8}+\frac{5}{12}}{1-\frac{15}{8}\cdot\frac{5}{12}}=\tan^{-1}\frac{220}{21}$$

$$\tan\left(\tan^{-1}\frac{220}{21}\right)=\frac{220}{21}$$