

## Questions with Answer Keys

MathonGo

## Q1 (20 July 2021 Shift 1)

The number of real roots of the equation

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

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

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Answer Key

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Q1 (4) Q2 (2)

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## Hints and Solutions

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Q1

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

For equation to be defined,

$$x^2 + x \geq 0$$

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

$\therefore$  only possibility that the equation is defined

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

None of these values satisfy

$\therefore$  No of roots = 0

Q2

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

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

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

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