

Determinants - Class XII

Past Year JEE Questions

Questions

Question: 01

The number of distinct real roots

$$\text{of } \begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0 \text{ in the interval } -\frac{\pi}{4} \leq x \leq \frac{\pi}{4} \text{ is :}$$

- A. 4
- B. 1
- C. 2
- D. 3

Solutions

Solution: 01

Explanation

$$\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0, \quad -\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$$

Apply : $R_1 \rightarrow R_1 - R_2$ & $R_2 \rightarrow R_2 - R_3$

$$\Rightarrow \begin{vmatrix} \sin x - \cos x & \cos x - \sin x & 0 \\ 0 & \sin x - \cos x & \cos x - \sin x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$$

$$\Rightarrow (\sin x - \cos x)^2 \begin{vmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$$

$$\Rightarrow (\sin x - \cos x)^2 (\sin x + 2\cos x) = 0$$

\therefore

$$x = \frac{\pi}{4}$$