Matrices and Determinants - Class XII

Past Year JEE Questions

Questions

Quetion: 01

If
$$A = \begin{bmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{bmatrix}$$
;

then for all $\theta \in \left(\frac{3\pi}{4}, \frac{5\pi}{4}\right)$, det (A) lies in the interval : A. $\begin{pmatrix} 3\\ 2 \end{pmatrix}, 3$ B. $\begin{pmatrix} 0, \frac{3}{2} \end{bmatrix}$ C. $\begin{bmatrix} 5\\ 2 \end{pmatrix}, 4 \end{pmatrix}$ D. $\begin{pmatrix} 1, \frac{5}{2} \end{bmatrix}$

Solutions

Solution: 01

Explanation

$$|A| = \begin{vmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{vmatrix}$$

$$= 2(1 + \sin^2\theta)$$

$$\theta \in \left(\frac{3\pi}{4}, \frac{5\pi}{4}\right) \Rightarrow \frac{1}{\sqrt{2}} < \sin \theta < \frac{1}{\sqrt{2}}$$

$$\Rightarrow 0 \le \sin^2 \theta < \frac{1}{2}$$

$$|A| \in [2,3)$$