Past Year JEE Questions

Questions

Quetion: 01

If $\Delta_1 = \begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ and

$\Delta_2 = \begin{vmatrix} x & \sin 2\theta & \cos 2\theta \\ -\sin 2\theta & -x & 1 \\ \cos 2\theta & 1 & x \end{vmatrix}, x \neq 0$;

then for all $\theta \in \left(0, \frac{\pi}{2}\right)$:

A. $\Delta_1 - \Delta_2 = x \,(\cos 2\theta - \cos 4\theta)$

B. $\Delta_1 + \Delta_2 = -2x^3$

C. $\Delta_1 + \Delta_2 = -2(x^3 + x -1)$

D. $\Delta_1 - \Delta_2 = -2x^3$

Solutions

Solution: 01

Explanation

$\Delta_1 = \begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$

$= x(-x^2 -1) - \sin\theta(-x\sin\theta - \cos\theta) + \cos\theta(-\sin\theta + x\cos\theta)$

$= -x^3 - x + x\sin^2\theta + \sin\theta\cos\theta - \cos\theta\sin\theta + x\cos^2\theta$

$= -x^3 - x + x = -x^3$

Similarly $\Delta_2 = -x^3$

$\Delta_1 + \Delta_2 = -2x^3$