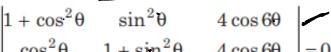
Problem Solving on Determinants



By Ankush Garg(B. Tech, IIT Jodhpur) A value of $\theta \in (0, \pi/3)$, for which

Row, column Operation





 $\cos^2\theta$ 1 + $\sin^2\theta$ 4 cos 60 = 0, is $\cos^2\theta$ $\sin^2\theta$ $1 + 4\cos6\theta$

(2019 Main, 12 April II)



(b)
$$\frac{\pi}{18}$$

(b)
$$\frac{\pi}{18}$$
 (c) $\frac{7\pi}{24}$ (d) $\frac{7\pi}{36}$

(d)
$$\frac{7\pi}{36}$$

$$R_2 \longrightarrow R_2 - R_3$$

$$\rightarrow R_2 - R_3$$
 , $R_1 \rightarrow R_1 - R_3$

The sum of the real roots of the equation $\begin{vmatrix} 2 & -3x & x-3 \\ -3 & 2x & x+2 \end{vmatrix} = 0, \text{ is equal to}$ (2019 Main, 10 April II) (b) -4



$$x[-3x(x+2) - 2x(x-3)] + 6[2x+4 + 3x-9] + (-1)[4x-9x] = 0$$

$$x[-3x^2-6x-2x^2+6x] + 6[5x-5] + 5x$$

$$-5x^3 + 35x - 30 = 0$$

$$-3x^3+bx^2+(x+d=0)$$
Sum of roots = 0

Theory of eq.



Let α and β be the roots of the equation $x^2 + x + 1 = 0$.

Then, for $y \neq 0$ in **R**,

$$\begin{vmatrix} y+1 & \alpha & \beta \\ \alpha & y+\beta & 1 \\ \beta & 1 & y+\alpha \end{vmatrix}$$
 is equal to

<, B - value >

$$\frac{1}{\sqrt{\beta}} = -1$$

If
$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$$

=
$$(\underline{a+b+c})(\underline{x+a+b+c})^2$$
, $x \neq 0$ and $a+b+c \neq 0$, then x is equal to (2019 Main, 11 Jan II)

- x is equal to (a) -(a+b+c) (b) -2(a+b+c)
- (c) 2(a + b + c) (d) abc

Let
$$A = \begin{bmatrix} 2 & b & 1 \\ b & b^2 + 1 & b \\ 1 & b & 2 \end{bmatrix}$$
, where $b > 0$. Then, the minimum

value of $\frac{\det(A)}{b}$ is

(a) $-\sqrt{3}$ (b) $-2\sqrt{3}$

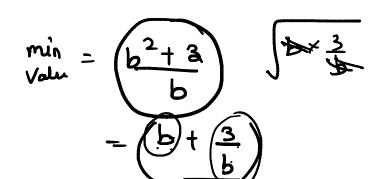
(a)
$$-\sqrt{3}$$

(b)
$$-2\sqrt{3}$$



(2019 Main, 10 Jan II)

(d)
$$\sqrt{3}$$



$$\begin{vmatrix} 2 & 1 & 1 \\ b & b^2 + 1 & b \\ 1 & b & 2 \end{vmatrix} =$$

$$R_1 \longrightarrow R_1 - R_3$$

$$\begin{vmatrix}
1 & 0 & -1 \\
b & b^2 + 1 & b
\end{vmatrix}$$

$$\begin{vmatrix} 1 & 0 & -1 \\ b & b^{2+1} & b \end{vmatrix} = 1(b^{2}+2) - 1(-1)$$

$$= (b^{2}+3)$$

S Let
$$d \in R$$
, and

$$A = \begin{bmatrix} -2 & 4+d & (\sin\theta)-2 \\ 1 & (\sin\theta)+2 & \underline{d} \\ 5 & (2\sin\theta)-d & (-\sin\theta)+2+2\underline{d} \end{bmatrix}, -\theta \in [\theta, 2\pi]. \text{ If }$$

the minimum value of $\det(A)$ is 8, then a value of d is (2019 Main, 10 Jan I)

$$(a)$$
 -5

(c)
$$2(\sqrt{2} + 1)$$

(b)
$$-7$$
 (c) $2(\sqrt{2} + 1)$ (d) $2(\sqrt{2} + 2)$

$$R_{3} \rightarrow R_{3} + R_{1} - 2R_{2} \qquad (d+1)^{2} \sin^{2}\theta = 8$$

$$1 + (\sin \theta - 2) \qquad (d+2)^{2} - 1 = 9$$

$$1 + (\sin \theta - 2) \qquad (d+2)^{2} = 9$$

$$1 + (d^{2} + 4d) - (\sin \theta - 4) = |A|$$

$$1 + (d^{2} + 4d) - (\sin \theta - 4) = |A|$$

$$1 + (d^{2} + 4d) - (\sin \theta - 4) = |A|$$

If
$$\begin{vmatrix} x-4 & 2x & 2x \\ 2x & x-4 & 2x \\ 2x & 2x & x-4 \end{vmatrix} = \underline{(A+Bx)(x-A)^2}, \text{ then the}$$

ordered pair (A, B) is equal to (2018 Main) (a) (-4, -5) (b) (-4, 3) (c) (4, 5) (d) (4, 5)

(a)
$$(-4, -5)$$
 (b)