WBJEE

BONG MOTION

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CHAPTER WISE PYQ

VECTOR 3D

Lecture No - 1

WBJEE CHAPTER WISE PYQ
Vector 3D

Q1. The value of λ for which the straight line $\frac{x-\lambda}{3} = \frac{y-1}{2+\lambda} = \frac{z-3}{-1}$ may lie on the plane $x-2y=0$, is —

(2015)

(A) 2 (B) 0 (C) $-\frac{1}{2}$ (D) None

Solution:

L_1 : 3, $2+\lambda$, -1

P : 1, -2, 0

$3\cdot 1 + (2+\lambda)(-2) + (-1)\times 0 = 0$

$\Rightarrow 3 - 4 - 2\lambda + 0 = 0$

$\Rightarrow -2\lambda = 1$

$\Rightarrow \lambda = -\frac{1}{2}$

$\frac{x+\frac{1}{2}}{3} = \frac{y-1}{2-\frac{1}{2}} = \frac{z-3}{-1} = r$

$x = 3r - \frac{1}{2}$

$y = \frac{3}{2}r + 1$

$z = -r + 3$

$3r - \frac{1}{2} = 2\left(\frac{3}{2}r + 1\right)$

$\Rightarrow 3r - \frac{1}{2} = 3r + 2$

$r \in R$, !!!

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Q2. Angle between the planes $x+y+2z=6$ and $2x-y+z=9$ is — (2016)

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

Solution:

P_1 : 1, 1, 2

P_2 : 2, −1, 1

$$\therefore \theta = \cos^{-1}\left(\frac{1\cdot 2 + 1\cdot(-1) + 2\cdot 1}{\sqrt{1+1+4}\cdot\sqrt{4+1+1}}\right)$$

$$= \cos^{-1}\left(\frac{3}{6}\right) = \cos^{-1}\left(\frac{1}{2}\right)$$

$$= \frac{\pi}{3}$$

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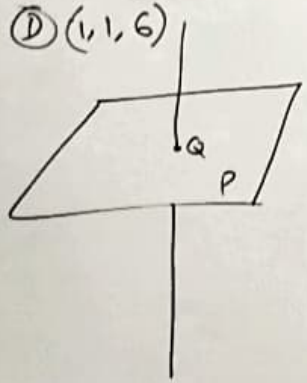
Q3. A straight line joining the points $(1,1,1)$ and $(0,0,0)$ intersects the plane $2x+2y+z=10$ at (2016)

(A) $(1,2,5)$ (B) $(2,2,2)$ (C) $(2,1,5)$ (D) $(1,1,6)$



Solution: $L: \frac{x-0}{1-0} = \frac{y-0}{1-0} = \frac{z-0}{1-0} = r$

$Q = (r, r, r)$

$2r + 2r + r = 10$

$\Rightarrow 5r = 10$

$\Rightarrow r = 2$

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Q4. The cosine of the angle between two diagonals of a cube is — (2016)

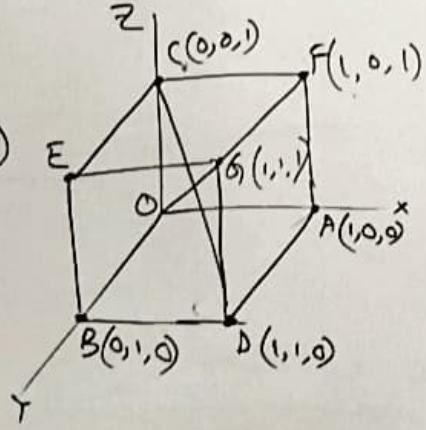
(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$ (D) $\frac{1}{\sqrt{3}}$

Solution: Drs. of OG $1, 1, 1$

Drs of CD $1, 1, -1$

$$\therefore \cos\theta = \left| \frac{1\cdot 1 + 1\cdot 1 + 1\cdot(-1)}{\sqrt{1+1+1}\cdot\sqrt{1+1+1}} \right|$$

$$= \frac{1+1-1}{\sqrt{3}\times\sqrt{3}} = \frac{1}{3}$$



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Q5. Three lines are drawn form the origin O with direction cosines proportional to (1, −1, 1), (2, −3, 0) and (1, 0, 3). The three lines are - (2017)

(A) not coplanar (B) Perpendicular to each other (C) Coplanar (D) Coincident

Solution:

$\vec{a} = \hat{i} - \hat{j} + \hat{k}$. $\vec{b} = 2\hat{i} - 3\hat{j} + 0\hat{k}$. $\vec{c} = \hat{i} + 0\hat{j} + 3\hat{k}$

$$[\vec{a}\ \vec{b}\ \vec{c}] = \begin{vmatrix} 1 & -1 & 1 \\ 2 & -3 & 0 \\ 1 & 0 & 3 \end{vmatrix}$$

$$= \begin{vmatrix} 2 & -3 \\ 1 & 0 \end{vmatrix} + 3\begin{vmatrix} 1 & -1 \\ 2 & -3 \end{vmatrix}$$

$= 3 + 3(-3+2)$

$= 3 + 3(-1)$

$= 3 - 3 = 0$

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Q6. The equation of the plane through $(1, 2, -3)$ and $(2, -2, 1)$ and parallel to X-axis is- (2017)

(A) $y - z + 1 = 0$ (B) $y - z - 1 = 0$ (C) $y + z - 1 = 0$ (D) $y + z + 1 = 0$

Solution:

Drs of x axis $1, 0, 0$

Drs of AB $1, -4, 4$

$$\begin{vmatrix} x-1 & y-2 & z+3 \\ 1 & -4 & 4 \\ 1 & 0 & 0 \end{vmatrix} = 0$$

$$\Rightarrow \begin{vmatrix} y-2 & z+3 \\ -4 & 4 \end{vmatrix} = 0$$

$$\Rightarrow 4(y-2) + 4(z+3) = 0$$

$$\Rightarrow y - 2 + z + 3 = 0 \Rightarrow y + z + 1 = 0$$

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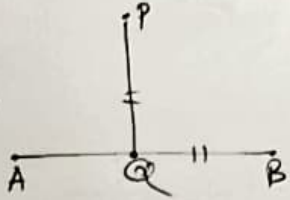
Q7. The foot of the perpendicular drawn from the point $(1, 8, 4)$ on the line joining the point $(0, -11, 4)$ and $(2, -3, 1)$ is

2018

(A) $(4, 5, 2)$ (B) $(-4, 5, 2)$ (C) $(4, -5, 2)$ (D) $(4, 5, -2)$

Solution: AB: $\frac{x-0}{2} = \frac{y+11}{8} = \frac{z-4}{-3} = r$



Q $(2r, 8r-11, -3r+4) = (4, 5, -2)$

Drs of PQ $2r-1, 8r-19, -3r$

$\therefore 2(2r-1) + 8(8r-19) - 3(-3r) = 0$

$\Rightarrow 4r - 2 + 64r - 152 + 9r = 0$

$\Rightarrow 77r = 154$

$r = 2$