NDA 1 2025

LIVE

MATHS

ANALYTICAL GEOMETRY 3D

CLASS 2

NAVJYOTI SIR

Crack
EXAMS

29 Oct 2024 Live Classes Schedule

8:00AM	29 OCTOBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	29 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 1 2025 LIVE CLASSES

11:30AM	GK - POLITY - MCQ CLASS	RUBY MA'AM
1:00PM	CHEMISTRY - THERMODYNAMICS	SHIVANGI MA'AM
4:00PM	MATHS - ANALYTICAL GEOMETRY 3D - CLASS 2	NAVJYOTI SIR
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM

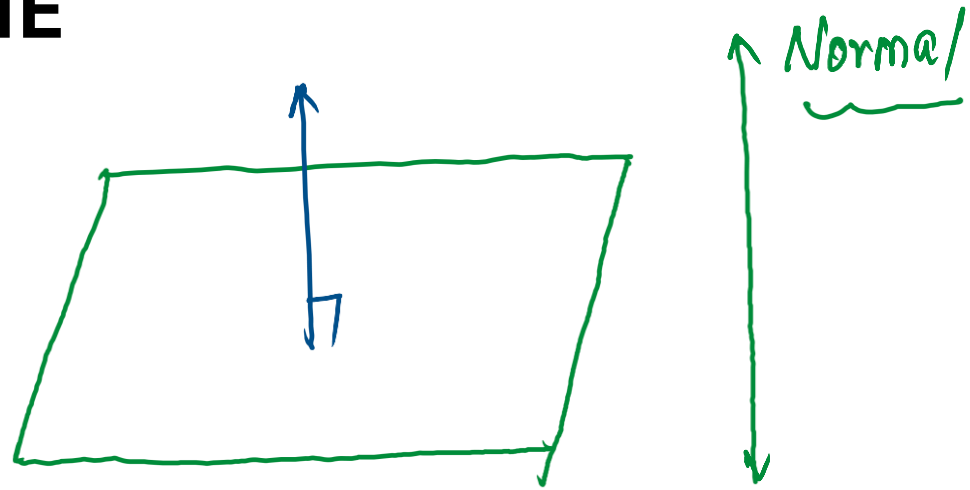
CDS 1 2025 LIVE CLASSES

11:30AM	GK - POLITY - MCQ CLASS	RUBY MA'AM
1:00PM	CHEMISTRY - THERMODYNAMICS	SHIVANGI MA'AM
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM
7:00PM	MATHS - MENSURATION 2D - CLASS 3	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

4:00PM	STATIC GK - IMPORTANT STRAITS & INTERNATIONAL BORDERS	DIVYANSHU SIR
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM
7:00PM	MATHS - MENSURATION 2D - CLASS 3	NAVJYOTI SIR

PLANE



→ direction ratio / cosines of line perpendicular to the given plane.

EQUATION OF PLANE

(1) $lx + my + nz = p$

($l, m, n \longrightarrow$ direction cosines perpendicular to plane)

$p \longrightarrow$ perpendicular distance of plane from origin.

General form of plane,

(#) $Ax + By + Cz + D = 0$

(2) direction ratios normal to plane, $\langle a, b, c \rangle$ and plane passes through (x_1, y_1, z_1)

(#) $a(x-x_1) + b(y-y_1) + c(z-z_1) = 0$

(3) plane passing through 3 non-collinear points, (x_1, y_1, z_1) (x_2, y_2, z_2) and (x_3, y_3, z_3)

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ x_3-x_1 & y_3-y_1 & z_3-z_1 \end{vmatrix} = 0$$

(4) plane has intercepts $(a,0,0)$, $(0,b,0)$ and $(0,0,c)$

$$\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$$

(5) plane passing through intersection of two planes,

(#) $P_1 : a_1x + b_1y + c_1z + d = 0$ $\quad P_2 : a_2x + b_2y + c_2z + d = 0$

$$P_1 + \lambda P_2 = 0$$

QUESTION

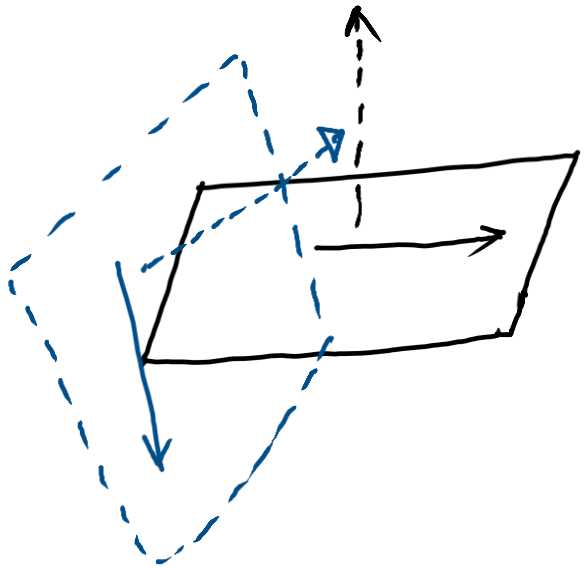
A plane meets the co-ordinates axis in A, B, C such that the centroid of the $\triangle$ ABC is the point (α, β, γ). Find the equation of the plane.

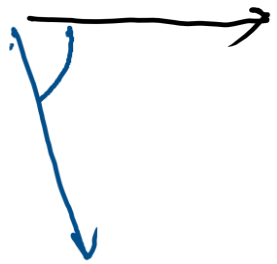
ANGLE BETWEEN TWO PLANES

$$a_1x + b_1y + c_1z + d_1 = 0$$

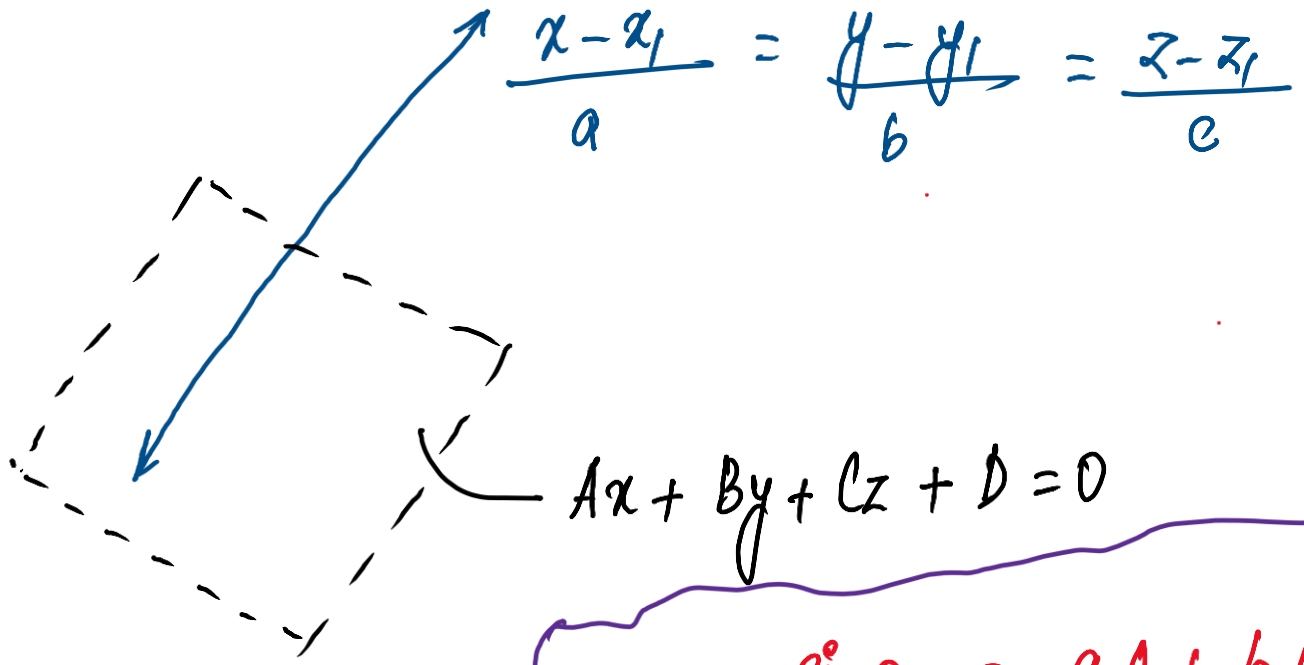
$$a_2x + b_2y + c_2z + d_2 = 0$$

$$\cos\theta = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\ \sqrt{a_2^2 + b_2^2 + c_2^2}}$$





ANGLE BETWEEN A LINE AND PLANE

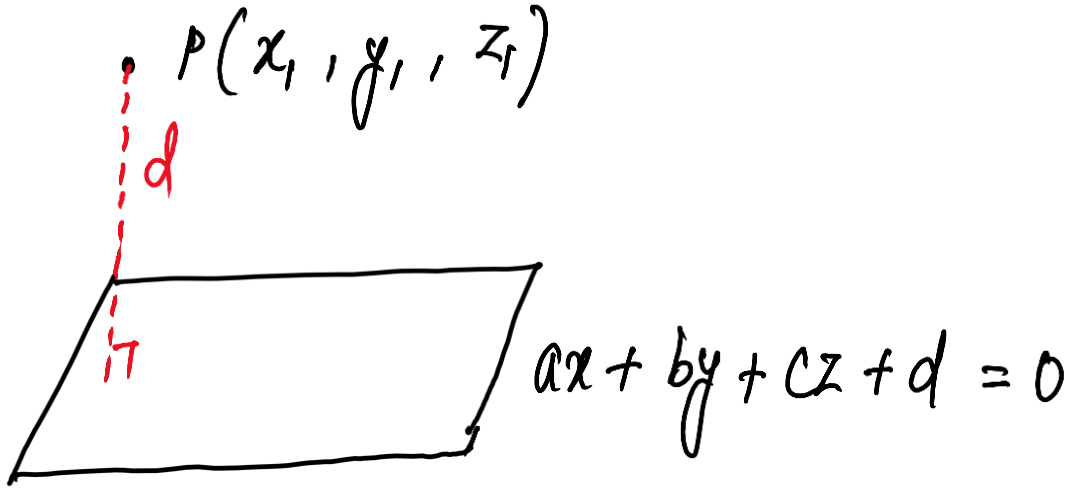


$$\frac{x-x_1}{a} = \frac{y-y_1}{b} = \frac{z-z_1}{c}$$

$$Ax + By + Cz + D = 0$$

$$\sin\theta = \frac{aA + bB + cC}{\sqrt{a^2+b^2+c^2}\,\sqrt{A^2+B^2+C^2}}$$

DISTANCE OF A POINT FROM PLANE



$$d = \frac{|ax_1 + by_1 + cz_1 + d|}{\sqrt{a^2 + b^2 + c^2}}$$

EQUATION OF PLANES BISECTING ANGLES BETWEEN TWO PLANES

$P_1 : a_1x + b_1y + c_1z + d_1 = 0$

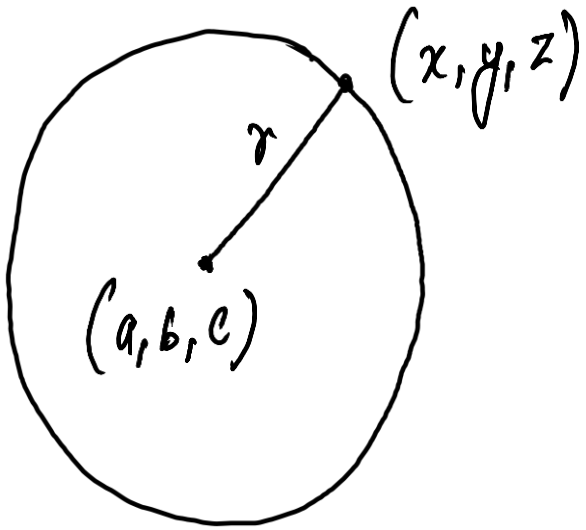
$P_2 : a_2x + b_2y + c_2z + d_2 = 0$

A point on this plane will be equidistant from P_1 and P_2

(x_1, y_1, z_1)

$$\frac{|a_1x + b_1y + c_1z + d_1|}{\sqrt{a_1^2 + b_1^2 + c_1^2}} = \frac{|a_2x + b_2y + c_2z + d_2|}{\sqrt{a_2^2 + b_2^2 + c_2^2}}$$

SPHERE



eqn of sphere :

$$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$$

GENERAL EQUATION OF A SPHERE

$$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$$

$$x^2 - 2ax + a^2 + y^2 - 2by + b^2 + z^2 - 2cz + c^2 = r^2$$

$$x^2 - 2ax + y^2 - 2by + z^2 - 2cz + d = 0$$

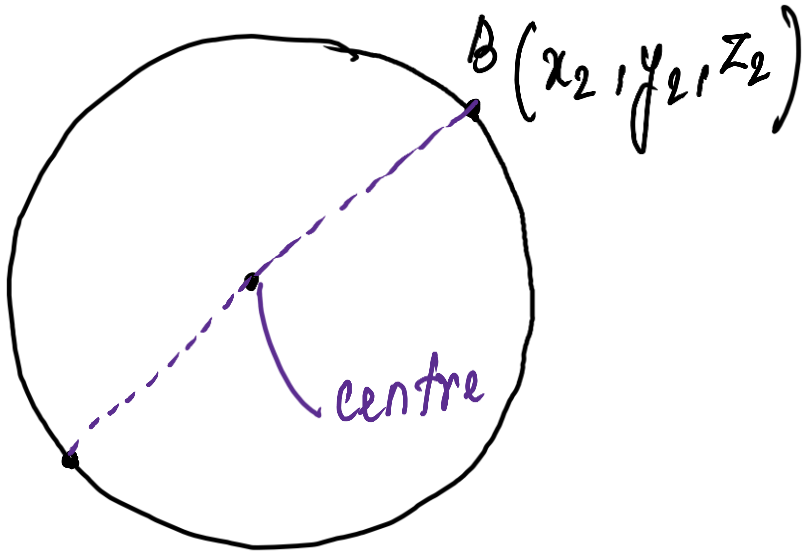
$$d = a^2 + b^2 + c^2 - r^2$$

$$x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$$

centre $\rightarrow (-u, -v, -w)$

radius $\rightarrow \sqrt{u^2 + v^2 + w^2 - d}$

EQUATION OF SPHERE WITH GIVEN DIAMETER



A and B are end points of diameter, whose coordinates are given,

eqn of sphere,

$$(x-x_1)(x-x_2)+(y-y_1)(y-y_2)+(z-z_1)(z-z_2)=0$$

If (1, –1, 2) and (2, 1, –1) are the end points of a diameter of a sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz - 1 = 0$, then what is $u + v + w$ equal to ?

(PYQ – 2024 – I)

(a) –2

(b) –1

(c) 1

(d) 2

coordinates of centre $\longrightarrow \left(\frac{1+2}{2}, \frac{-1+1}{2}, \frac{2-1}{2}\right) = \left(\frac{3}{2}, 0, \frac{1}{2}\right)$

$x^2 + y + z^2 + 2ux + 2vy + 2wz - 1 = 0$

coordinates of centre $\longrightarrow (-u, -v, -w)$

equating,

$u = -\frac{3}{2}$

$v = 0$

$w = -\frac{1}{2}$

$u + v + w = -\frac{3}{2} + 0 + \left(-\frac{1}{2}\right) = -\frac{4}{2} = -2$

If $< l, m, n >$ are the direction cosines of a normal to the plane $2x - 3y + 6z + 4 = 0$, then what is the value of $49(7l^2 + m^2 - n^2)$?

(PYQ – 2024 – I)

$ax + by + cz + d = 0$

dir. ratios

(a) 0

(b) 1 ✓

(c) 3

(d) 71

$l = \frac{2}{\sqrt{2^2+(-3)^2+6^2}}$; $m = \frac{-3}{\sqrt{49}}$; $n = \frac{6}{\sqrt{49}}$

$49(7l^2 + m^2 - n^2)$

$49\left(\frac{7(2)^2}{49} + \frac{(-3)^2}{49} - \frac{(6)^2}{49}\right) = 28 + 9 - 36$

$= 1$

A line through $(1, -1, 2)$ with direction ratios $<3, 2, 2>$ meets the plane $x + 2y + 3z = 18$. What is the point of intersection of line and plane ?

(PYQ – 2024 – I)

(a) (4, 4, 1)

(b) (2, 4, 1)

(c) (4, 1, 4)

(d) (3, 4, 7)

points should satisfy the eqn of plane

If p is the perpendicular distance from origin to the plane passing through (1, 0, 0), (0, 1, 0) and (0, 0, 1), then what is $3p^2$ equal to ?

(PYQ – 2024 – I)

(a) 4

(b) 3

(c) 2

(d) 1

(PYQ – 2024 – II)

Let $2x^2 + 2y^2 + 2z^2 + 3x + 3y + 3z - 6 = 0$ be a sphere.

What is the diameter of the sphere?

(a) $\frac{5\sqrt{3}}{4}$

(b) $\frac{5\sqrt{3}}{2}$

(c) $\frac{3\sqrt{5}}{4}$

(d) $\frac{3\sqrt{5}}{2}$

Let $2x^2 + 2y^2 + 2z^2 + 3x + 3y + 3z - 6 = 0$ be a sphere. **(PYQ – 2024 – II)**

The centre of the sphere lies on the plane

(a) $2x + 2y + 2z - 3 = 0$

(b) $4x + 4y + 4z - 3 = 0$

(c) $4x + 8y + 8z - 15 = 0$

(d) $4x + 8y + 8z + 15 = 0$

(PYQ – 2024 – II)

Let S be the line of intersection of two planes $x+y+z=1$ and $2x+3y-4z=8$.

Which of the following are the direction ratios of S?

(a) $\langle -7, -6, 1 \rangle$

(b) $\langle -7, 6, 1 \rangle$

(c) $\langle -6, 5, 1 \rangle$

(d) $\langle 6, 5, 1 \rangle$

Let S be the line of intersection of two planes $x+y+z=1$ and $2x+3y-4z=8$.

(PYQ – 2024 – II)

If $\langle l, m, n\rangle$ are direction cosines of S, then what is the value of $43(l^2-m^2-n^2)$?

(a) 6

(b) 5

(c) 4

(d) 1

Let $L: x+y+z+4=0=2x-y-z+8$ be a line and $P: x+2y+3z+1=0$ be a plane. **(PYQ – 2024 – II)**

What are the direction ratios of the line?

(a) $\langle 2, 1, -1 \rangle$

(b) $\langle 0, -1, 2 \rangle$

(c) $\langle 0, 1, -1 \rangle$

(d) $\langle 2, 3, -3 \rangle$

(PYQ – 2024 – II)

Let $L: x+y+z+4=0=2x-y-z+8$ be a line and $P: x+2y+3z+1=0$ be a plane.

What is the point of intersection of L and P?

(a) (4, 3, – 3)

(b) (4, – 3, 3)

(c) (–4, – 3, – 3)

(d) (–4, – 3, 3)

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