Intersection of a Line and a Plane

SUBJECT : MATHEMATICS
CHAPTER NUMBER:11
CHAPTER NAME :THREE DIMENTIONAL GEOMETRY

Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: 1800 120 2316
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

Intersection of a line and a plane

Here we will discuss the problem related to find the point of intersection of a line and a plane.

The **working rule** as follows:

Step-I Write the equation of the plane in Cartesian form if it is in the vector form.

Step-II Write the equation of the given line in parametric form.

Step-III Put the values of $x,\ y,\ z$ in the equation of the plane to get the value of parameter.

Step-IV Find the point of intersection by substituting the value of the parameter in the parametric equation of the line.

Example

Find the coordinate of the point where the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{2}$ intersects the plane $x - y + z - 5 = 0$

Example

Find the distance of the point $P(3, 4, 4)$ from the point, where the line joining the points $A(3, -4, -5)$ and $B(2, -3, 1)$ intersects the plane $2x + y + z = 7$.

Example

Find the coordinate of the point where the line through the points $A(3,4,1)$ and $B(5,1,6)$ crosses the xz-plane, Also find the angle which this line makes with the xz-plane.

Example

Find the coordinate of the point where the line $\vec{r} = \left(-\hat{\imath} - 2\hat{\jmath} - 3\hat{k}\right) + \lambda\left(3\hat{\imath} + 4\hat{\jmath} + 3\hat{k}\right)$ meets the plane which is perpendicular to the vector $\vec{n} = \hat{\imath} + \hat{\jmath} + 3\hat{k}$ and at a distance of $\frac{4}{\sqrt{11}}$ units from origin.

Example

Find the distance of the point (-1, -5, -10) from the point of intersection of the line $\vec{r} = (2\hat{\imath} - \hat{\jmath} + 2\hat{k}) + \lambda(3\hat{\imath} + 4\hat{\jmath} + 2\hat{k})$ and the plane $\vec{r}.(\hat{\imath} - \hat{\jmath} + \hat{k}) = 5$.

Assignments

1. Find the sum of the intercepts cut off by plane $2x + y - z = 5$ on the co-ordinate axes.
2. Find the equation of the plane which passes through the point $(3, 2, 0)$ and contains the line $\frac{x-3}{1} = \frac{y-6}{5} = \frac{z-4}{4}$.
3. Write the equation of the plane which is at a distance of $5\sqrt{3}$ units from origin and the normal to which is equally inclined to co-ordinate axes.
4. Write the vector equation of the plane, passing through the point (a, b, c) and parallel to the plane $\vec{r}.\left(\hat{\imath} + \hat{\jmath} + \hat{k}\right) = 2$

ODM EDUCATIONAL GROUP
Changing your Tomorrow

THANKING YOU

ODM EDUCATIONAL GROUP