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Distance of a Point From a Plane

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

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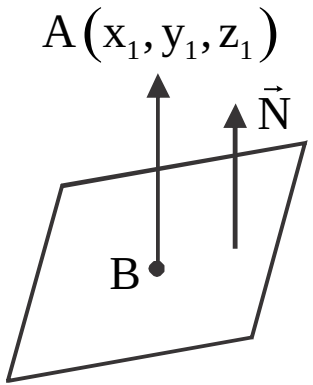
Introduction

The distance of the point in vector form whose position vector is $\vec{a}$ from the plane $\vec{r}.\vec{N} = d$ is $\left|\frac{\vec{a}.\vec{N}-d}{|\vec{N}|}\right|$.



In cartesian form the distance of the point $A(x_1, y_1, z_1)$ from the plane $ax + by + cz = d$ is $\left|\frac{ax_1+by_1+cz_1-d}{\sqrt{a^2+b^2+c^2}}\right|$

Example

Find the distance of the point $(2, 3, -5)$ from the plane $x + 2y - 2z = 9$.

Example

Find the distance of the point $(2, 5, -3)$ from the plane $\vec{r}.\left(6\hat{\imath} - 3\hat{\jmath} + 2\hat{k}\right) = 4$.

Example

Find the distance between the planes $2x - 3y + 6y - 4 = 0$ and $6x - 9y + 18z + 30 = 0$

Example

If points $(1, 1, p)$ and $(-3, 0, 1)$ be equidistant from the plane $\vec{r}.\left(3\hat{\imath} + 4\hat{\jmath} - 12\hat{k}\right) + 13 = 0$, then find the value of p.

Example

If product of distances of the point $(1, 1, 1)$ from origin and the plane $\vec{r}.\left(\hat{\imath} - \hat{\jmath} + \hat{k}\right) = -p$ be 8, then find the value of p.

Assignments

1. Find the distance of the point $(2, 5, 3)$ from the plane $\vec{r}.\left(6\hat{\imath} - 3\hat{\jmath} + 2\hat{k}\right) = 4$

2. Find the distance between the planes $3x + 4y - 7 = 0$ and $6x + 8y + 6 = 0$

3. Find the coordinate, of the foot of perpendicular and perpendicular distance from point $P(4, 3, 2)$ to the plane $x + 2y + 3z = 2$. Also, find the image of P in the plane.

4. Find the equation of the plane passing through the line of intersection of the planes $\vec{r}.(\hat{\imath} + 3\hat{\jmath}) + 6 = 0$ and $\vec{r}.\left(3\hat{\imath} - \hat{\jmath} + 4\hat{k}\right) = 0$. Whose perpendicular distance from the origin is unity.

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