

Exemplar Problem

Three Dimensional Geometry

14. O is the origin and A is (a, b, c) . Find the direction cosines of the line OA and the equation of plane through A at right angle to OA.

Solution:

Given, O $(0, 0, 0)$ and A (a, b, c)

So, the direction ratios of OA = $a - 0, b - 0, c - 0 = a, b, c$

And, the direction cosines of line OA

$$= \frac{a}{\sqrt{a^2 + b^2 + c^2}}, \frac{b}{\sqrt{a^2 + b^2 + c^2}}, \frac{c}{\sqrt{a^2 + b^2 + c^2}}$$

Now, the direction ratios of the normal to the plane are (a, b, c) .

We know that, the equation of the plane passing through the point A (a, b, c) is

$$a(x - a) + b(y - b) + c(z - c) = 0$$

$$ax - a^2 + by - b^2 + cz - c^2 = 0$$

$$ax + by + cz = a^2 + b^2 + c^2$$

Thus, the required equation of the plane is $ax + by + cz = a^2 + b^2 + c^2$