

Chapter 12

THREE DIMENSIONAL GEOMETRY

Any point on x – axis $\rightarrow (x, 0, 0)$

Any point on y – axis $\rightarrow (0, y, 0)$

Any point on z – axis $\rightarrow (0, 0, z)$

Any point on XY - plane $\rightarrow (x, y, 0)$

Any point on YZ - plane $\rightarrow (0, y, z)$

Any point on ZX - plane $\rightarrow (x, 0, z)$

Distance between two points P (x_1, y_1, z_1) and Q (x_2, y_2, z_2) is

$$|PQ| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

The co- ordinates of R which divides a line segment joining the points

P (x_1, y_1, z_1) and Q (x_2, y_2, z_2)

Internally and externally in the ratio m : n *are* respectively

R $\left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}, \frac{mz_2 + nz_1}{m+n} \right)$ and

S $\left(\frac{mx_2 - nx_1}{m-n}, \frac{my_2 - ny_1}{m-n}, \frac{mz_2 - nz_1}{m-n} \right)$

The coordinates of the centroid of the triangle whose vertices are (x_1, y_1, z_1), (x_2, y_2, z_2) and (x_3, y_3, z_3) is

$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3} \right)$$

TEXT BOOK QUESTIONS

* \rightarrow Exercise 12 .2 -- 3, 4, 5

\rightarrow Example – 7, 8, 9, 10, 11, 12, 13

** \rightarrow Exercise 12 .3 -- 3, 4, 5

\rightarrow Misc Q 1 to Q 6

Extra Questions:

1. Find the distance between $(-3, 4, -6)$ and its image in the XY – plane.

(ans : 12 units)

2. Find the points on the y- axis which are at a distance of 3 units from the point $(2, 3, -1)$

(ans : $(0, 1, 0), (0, 5, 0)$)

3. If A and B are the points $(1, 2, 3)$ and $(-1, 4, -3)$ respectively then find the locus of a point P such that $PA^2 - PB^2 = 2k^2$

(ans : $2x - 2y + 6z + 6 + k^2 = 0$)

4. If the points A $(1, 0, -6)$, B $(-3, p, q)$ and C $(-5, 9, 6)$ are collinear, find the values of p and q.

(ans : $p = 6, q = 2$)

5. Two vertices of a triangle are $(2, -6, 4)$, $(4, -2, 3)$ and its centroid is $(\frac{8}{2}, -1, 3)$, find the third vertex.

(ans : $(2, 5, 2)$)