

1.8.4

EE24BTECH11058 - P.Shiny Diavajna

Question: Find the coordinates of a point on Y axis which is at a distance of $5\sqrt{2}$ from the point $\mathbf{P}(3, -2, 5)$

Solution:

Variable	Description
$\mathbf{P}(3, -2, 5)$	Point \mathbf{P}
$\mathbf{Q}(0, y, 0)$	Point on Y axis
$\mathbf{Q1}, \mathbf{Q2}$	Possible Points of \mathbf{Q}
y	y coordinate of the point \mathbf{Q}
l, m, n	Directional cosines of line joining \mathbf{P} and \mathbf{Q}
r	Distance between \mathbf{P} and \mathbf{Q}

TABLE 0: Variables Used

$$\mathbf{Q} = \mathbf{P} + \begin{pmatrix} l \\ m \\ n \end{pmatrix} r$$

$$\begin{pmatrix} 0 \\ y \\ 0 \end{pmatrix} = \begin{pmatrix} 3 \\ -2 \\ 5 \end{pmatrix} + \begin{pmatrix} l \\ m \\ n \end{pmatrix} 5\sqrt{2}$$

$$l = \frac{-3}{5\sqrt{2}}$$

$$n = \frac{-5}{5\sqrt{2}}$$

$$l^2 + m^2 + n^2 = 1$$

$$m = \pm \frac{4}{5\sqrt{2}}$$

$$y = -6 \text{ (or) } y = 2$$

$$\mathbf{Q1} = \begin{pmatrix} 0 \\ -6 \\ 0 \end{pmatrix}, \mathbf{Q2} = \begin{pmatrix} 0 \\ 2 \\ 0 \end{pmatrix}$$

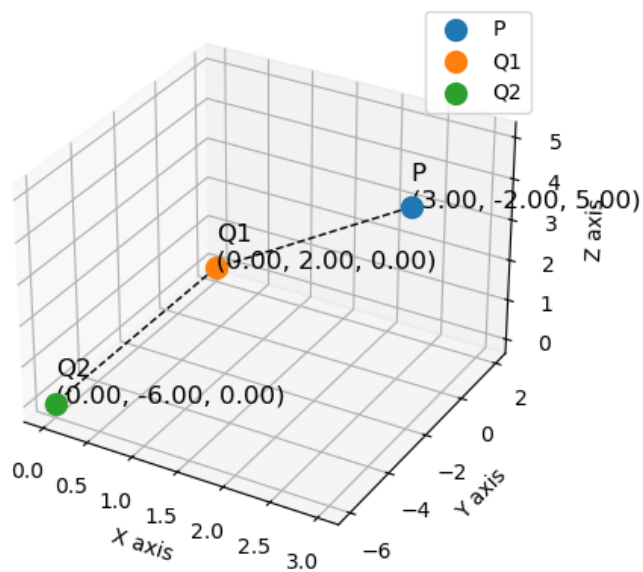


Fig. 0.1: Plot of P, Q1 and Q2