

Question 1-1.10-9

EE24BTECH11015 - Dhawal

- 1) Find the unit vector in the direction of vector \overrightarrow{PQ} , where **P** and **Q** are the points (1, 2, 3) and (4, 5, 6), respectively.

Variable	Description	Values
P	Point given	(1, 2, 3)
Q	Point given	(4, 5, 6)
A	Unit vector in \overrightarrow{PQ}	To Find

TABLE 1: Variables Used

Solution:

As **A** is a unit vector in the direction of \overrightarrow{PQ} :

$$\mathbf{A} = \frac{\mathbf{Q} - \mathbf{P}}{\|\mathbf{Q} - \mathbf{P}\|} \quad (1.1)$$

Finding $\mathbf{Q} - \mathbf{P}$:

$$\mathbf{Q} - \mathbf{P} = \begin{pmatrix} 4 \\ 5 \\ 6 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 3 \\ 3 \\ 3 \end{pmatrix} \quad (1.2)$$

Finding $\|\mathbf{Q} - \mathbf{P}\|$:

$$\|\mathbf{Q} - \mathbf{P}\| = \sqrt{\begin{pmatrix} 3 & 3 & 3 \end{pmatrix} \begin{pmatrix} 3 \\ 3 \\ 3 \end{pmatrix}} = \sqrt{27} = 3\sqrt{3} \quad (1.3)$$

Putting the values in the equation:

$$\mathbf{A} = \frac{1}{3\sqrt{3}} \begin{pmatrix} 3 \\ 3 \\ 3 \end{pmatrix} = \begin{pmatrix} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \end{pmatrix} \quad (1.4)$$

Hence unit vector in direction of \overrightarrow{PQ} is $\begin{pmatrix} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \end{pmatrix}$

3D Line Plot

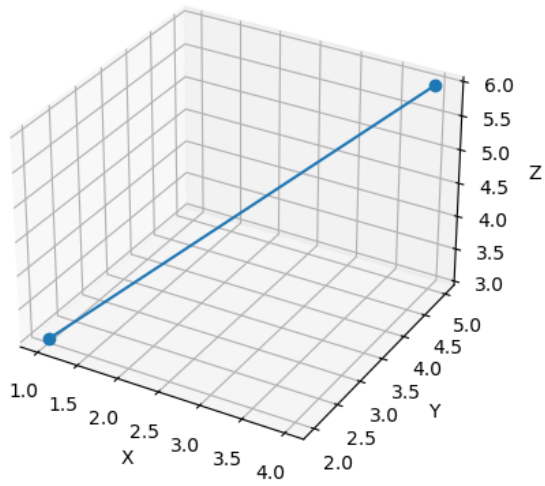


Fig. 1.1: Vector A