

# 1.11.12

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## Question:

Find the direction cosines of the line joining the points  $\mathbf{P}(4, 3, -5)$  and  $\mathbf{Q}(-2, 1, -8)$ .

## Solution:

The vector components of the given points are  $\mathbf{P} \begin{pmatrix} 4 \\ 3 \\ -5 \end{pmatrix}$ ,  $\mathbf{Q} \begin{pmatrix} -2 \\ 1 \\ -8 \end{pmatrix}$ .

The unit vector in the direction of  $\mathbf{PQ}$  is given as

$$\frac{\mathbf{Q} - \mathbf{P}}{\|\mathbf{Q} - \mathbf{P}\|}$$

$$\mathbf{Q} - \mathbf{P} = \begin{pmatrix} -6 \\ -2 \\ -3 \end{pmatrix} \quad (0.1)$$

$$\|\mathbf{Q} - \mathbf{P}\| = \sqrt{(-6)^2 + (-2)^2 + (-3)^2} = 7 \quad (0.2)$$

$$\frac{\mathbf{Q} - \mathbf{P}}{\|\mathbf{Q} - \mathbf{P}\|} = \frac{1}{7} \begin{pmatrix} -6 \\ -2 \\ -3 \end{pmatrix} \quad (0.3)$$

and the elements of the above vector are the direction cosines .

3D Plot of Points P, Q and Unit Vector along PQ

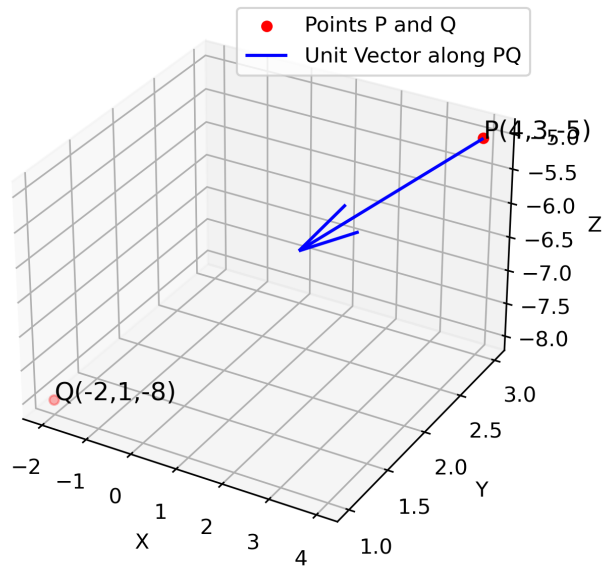


Fig. 0.1