1.11.10

EE24BTECH11021 - Eshan Ray

Question:
Find the direction cosines of the line joining points **P** (4, 3, -5) and **Q** (-2, 1, 8).
Solution:

Variable	Description	Formula
P	first point	$\begin{pmatrix} 4 \\ 3 \\ -5 \end{pmatrix}$
Q	second point	$\begin{pmatrix} -2 \\ 1 \\ 8 \end{pmatrix}$
D	direction cosines of line joining point **P** and **Q**	–

TABLE 0: Input parameters

$$D = \frac{\mathbf{P}-\mathbf{Q}}{\|\mathbf{P}-\mathbf{Q}\|} \tag{1}$$

$$\implies D = \frac{\mathbf{P}-\mathbf{Q}}{\sqrt{(\mathbf{P}-\mathbf{Q})(\mathbf{P}-\mathbf{Q})^{\top}}} \tag{2}$$

$$\implies D = \frac{\begin{pmatrix} 6 \\ 2 \\ -13 \end{pmatrix}}{\sqrt{\begin{pmatrix} 6 \\ 2 \\ -13 \end{pmatrix}\begin{pmatrix} 6 & 2 & -13 \end{pmatrix}}} \tag{3}$$

$$\implies D = \frac{\begin{pmatrix} 6 \\ 2 \\ -13 \end{pmatrix}}{\sqrt{209}} \tag{4}$$

$$\implies D = \begin{pmatrix} \frac{6}{\sqrt{209}} \\ \frac{2}{\sqrt{209}} \\ \frac{-13}{\sqrt{209}} \end{pmatrix} \tag{5}$$

The direction cosines of the line joining points **P** and **Q** are $\begin{pmatrix} \frac{6}{\sqrt{209}} \\ \frac{2}{\sqrt{209}} \\ \frac{-13}{\sqrt{209}} \end{pmatrix}$

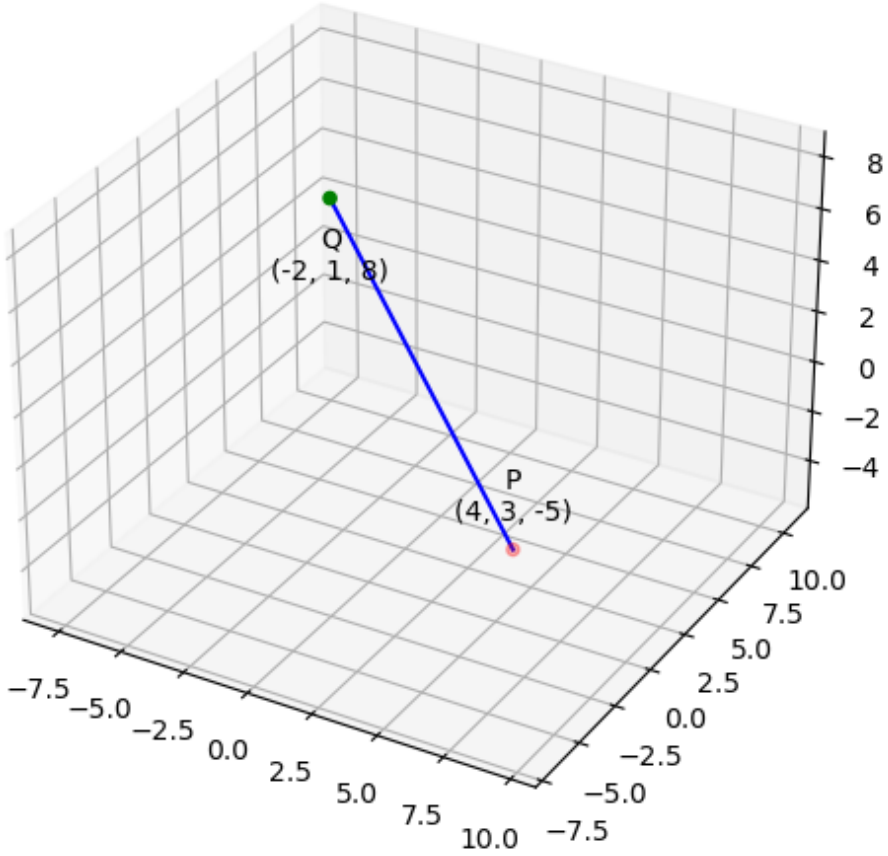

Fig. 0: Line PQ