1.11.8

AI24BTECH11019-KOTHA PRATHEEK REDDY

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

Solution: Let the unit vector in the direction of the vector $\mathbf{PQ}$ be $\hat{a}$.Then

$$\hat{a} = \frac{\mathbf{Q}-\mathbf{P}}{\|\mathbf{Q}-\mathbf{P}\|} \tag{0.1}$$

$$\mathbf{P} = \begin{pmatrix} 4 \\ 3 \\ -5 \end{pmatrix} \tag{0.2}$$

$$\mathbf{Q} = \begin{pmatrix} -2 \\ 1 \\ 8 \end{pmatrix} \tag{0.3}$$

$$\mathbf{Q}-\mathbf{P} = \begin{pmatrix} -6 \\ -2 \\ 13 \end{pmatrix} \tag{0.4}$$

$$\begin{aligned} \|\mathbf{Q}-\mathbf{P}\| &= \sqrt{(-6)^2+(-2)^2+13^2} \\ &= \sqrt{209} \end{aligned} \tag{0.5}$$

From the above equations,

$$\hat{a} = \begin{pmatrix} \frac{-6}{\sqrt{209}} \\ \frac{-2}{\sqrt{209}} \\ \frac{13}{\sqrt{209}} \end{pmatrix} \tag{0.6}$$

The direction vectors of the the line joining $\mathbf{A}$ and $\mathbf{B}$ are the elements of $\hat{a}$ i.e. $\frac{-6}{\sqrt{209}}$, $\frac{-2}{\sqrt{209}}$, $\frac{13}{\sqrt{209}}$

Point	Coordinate
$\mathbf{P}$	$\left(4,3,-5\right)$
$\mathbf{Q}$	$\left(-2,1,8\right)$

TABLE 0: Coordinates

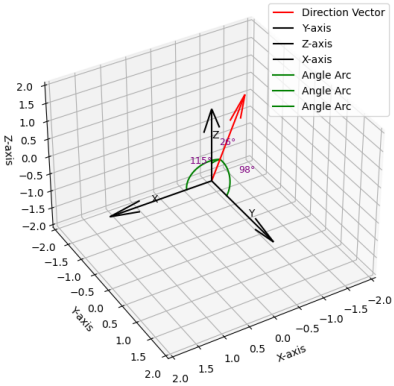

Fig. 0.1: Line joining **P** and **Q**