

1.11.18

Kotha Pratheek Reddy  
AI24BTECH11019

November 6, 2024

1 Problem

2 Solution

3 Plot

## Problem Statement

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

## Solution

Point	Coordinate
<b>P</b>	$(4, 3, -5)$
<b>Q</b>	$(-2, 1, 8)$

Table: Coordinates

## Solution

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

$$\hat{a} = \frac{\mathbf{Q} - \mathbf{P}}{\|\mathbf{Q} - \mathbf{P}\|} \quad (1)$$

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

$$\mathbf{Q} = \begin{pmatrix} -2 \\ 1 \\ 8 \end{pmatrix} \quad (3)$$

$$\mathbf{Q} - \mathbf{P} = \begin{pmatrix} -6 \\ -2 \\ 13 \end{pmatrix} \quad (4)$$

$$\begin{aligned} \|\mathbf{Q} - \mathbf{P}\| &= \sqrt{(-6)^2 + (-2)^2 + 13^2} \\ &= \sqrt{209} \end{aligned} \quad (5)$$

## Solution

From the above equations,

$$\hat{a} = \begin{pmatrix} \frac{-6}{\sqrt{209}} \\ \frac{-2}{\sqrt{209}} \\ \frac{13}{\sqrt{209}} \end{pmatrix} \quad (6)$$

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

# Plot

The codes in

<https://github.com/Pratheek39/EE1030/tree/c703931a5fffd529b14ab319f>

plot the following figure

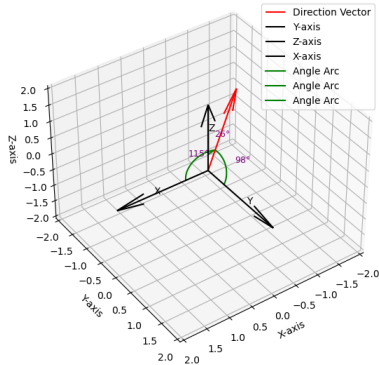


Figure: Line joining **P** and **Q**