

# Question-1-1.10-27

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## Question:

Write the direction ratios of the vector  $\vec{a} = \hat{i} + \hat{j} - \hat{k}$  and hence calculate its direction cosines

## Solution:

Variable	Description	Formula
$a$	A vector	$A = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}$

TABLE 0

$$\vec{a} = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix} \quad (0.1)$$

(0.2)

The direction ratios are 1,1,-1

Let the direction cosines be  $\cos\alpha$ ,  $\cos\beta$ ,  $\cos\gamma$

$$\|a\| = \sqrt{(a^T a)} \quad (0.3)$$

$$\|a\| = \sqrt{3} \quad (0.4)$$

$$\begin{pmatrix} \cos\alpha \\ \cos\beta \\ \cos\gamma \end{pmatrix} = \frac{\vec{a}}{\|a\|} \quad (0.5)$$

$$\begin{pmatrix} \cos\alpha \\ \cos\beta \\ \cos\gamma \end{pmatrix} = \frac{1}{\sqrt{3}} \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix} \quad (0.6)$$

The direction cosines are  $\cos\alpha = \frac{1}{\sqrt{3}}$ ,  $\cos\beta = \frac{1}{\sqrt{3}}$ ,  $\cos\gamma = \frac{-1}{\sqrt{3}}$

### Vector and its Direction Cosines

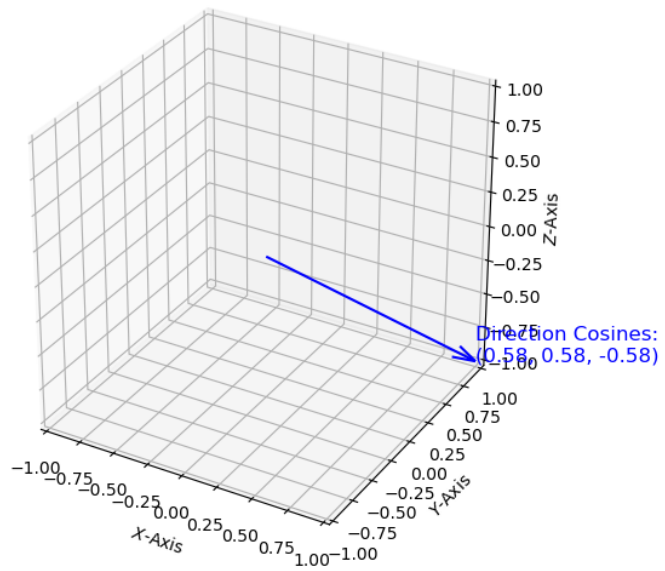


Fig. 0.1: Line **AB**