

1.6.7

EE24BTECH11002 - Agamjot Singh

Question:

If a line has direction ratios 2, -1, 2, determine its direction cosines.

Solution:

Let

$$\mathbf{A} = \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix} \quad (1)$$

$$\|\mathbf{A}\| = \sqrt{\mathbf{A}^T \mathbf{A}} \quad (2)$$

$$= \sqrt{\begin{pmatrix} 2 & -1 & 2 \end{pmatrix} \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}} \quad (3)$$

$$\Rightarrow \|\mathbf{A}\| = 3 \quad (4)$$

The unit direction vector of the line is

$$\frac{\mathbf{A}}{\|\mathbf{A}\|} = \frac{\begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}}{3} = \begin{pmatrix} \frac{2}{3} \\ -\frac{1}{3} \\ \frac{2}{3} \end{pmatrix} \quad (5)$$

Hence, the direction cosines of the line are $\frac{2}{3}$, $-\frac{1}{3}$ and $\frac{2}{3}$.

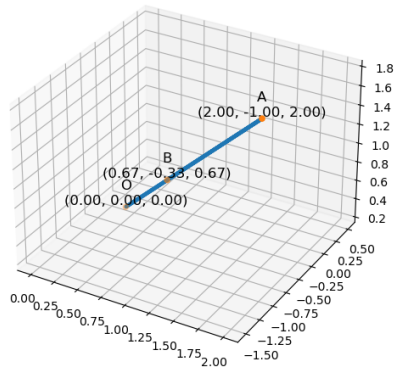


Fig. 0: Line with given direction ratios, where \mathbf{B} is unit direction vector