

1.11.7

EE24BTECH11001 - Aditya Tripathy

Question:

If a line has direction ratios -18, 12, -4, what are its direction cosines?

Solution: Let

$$\mathbf{A} = \begin{pmatrix} -18 \\ 12 \\ -4 \end{pmatrix} \quad (1)$$

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

$$= \sqrt{\begin{pmatrix} -18 & 12 & -4 \end{pmatrix} \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}} \quad (3)$$

$$\Rightarrow \|\mathbf{A}\| = 22 \quad (4)$$

The unit direction vector of the line is

$$\frac{\mathbf{A}}{\|\mathbf{A}\|} = \frac{\begin{pmatrix} -18 \\ 12 \\ -4 \end{pmatrix}}{22} = \begin{pmatrix} \frac{-9}{11} \\ \frac{6}{11} \\ \frac{-2}{11} \end{pmatrix} \quad (5)$$

Hence, the direction cosines of the line are $\frac{-9}{11}$, $\frac{6}{11}$ and $\frac{-2}{11}$.

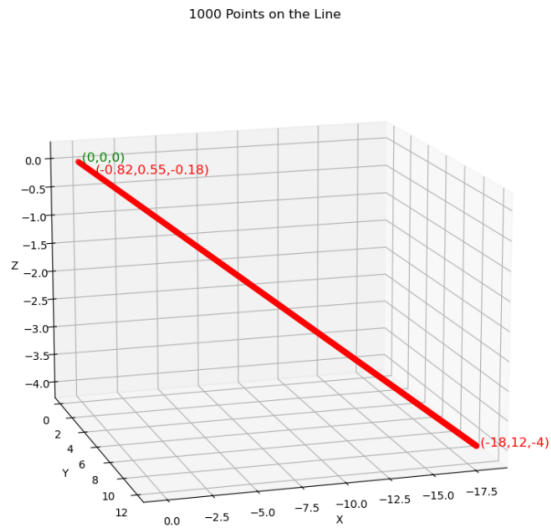


Fig. 0: Line with given direction ratios, where \mathbf{B} is unit direction vector