1.11.16

AI25BTECH11014 - Gooty Suhas

PROBLEM

The Cartesian equation of a line is

$$\frac{x-1}{2} = \frac{y+2}{2} = \frac{z-3}{3}$$

Find the direction cosines of a line parallel to this line.

SOLUTION

Let the direction vector be named:

$$\mathbf{D} = \begin{pmatrix} 2 \\ 2 \\ 3 \end{pmatrix} \tag{0.1}$$

Compute the magnitude of $\mathbf{D}$:

$$\|\mathbf{D}\| = \sqrt{2^2 + 2^2 + 3^2} \tag{0.2}$$

$$= \sqrt{4 + 4 + 9} = \sqrt{17} \tag{0.3}$$

Normalize the direction vector:

$$\mathbf{L} = \frac{1}{\sqrt{17}} \cdot \mathbf{D} \tag{0.4}$$

Let the point vector be:

$$\mathbf{P} = \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix} \tag{0.5}$$

Then the line can be expressed in matrix form as:

$$\mathbf{R} = \mathbf{P} + \lambda \cdot \mathbf{D} \tag{0.6}$$
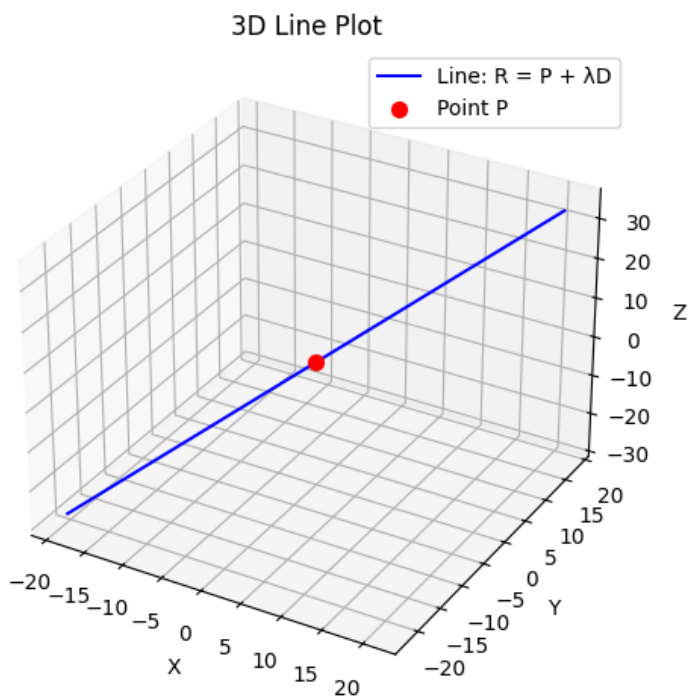
Where $\lambda \in \mathbb{R}$ is a scalar parameter.

Fig. 0.1: The line