4.5.10

EE25BTECH11008 - Anirudh M Abhilash

September 30, 2025

Question

Find the equation of the line passing through the point $(1, 2, 3)$ and parallel to the vector $3\hat{i} + 2\hat{j} - 2\hat{k}$

Solution

Let the point $\mathbf{h}$ and direction vector $\mathbf{m}$ be

$$\mathbf{h} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, \quad \mathbf{m} = \begin{pmatrix} 3 \\ 2 \\ -2 \end{pmatrix}.$$

The vector equation of the line is given by

$$\mathbf{x} = \mathbf{h} + \kappa\mathbf{m}, \quad \kappa \in \mathbb{R}.$$

Expanding,

$$\mathbf{x} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} + \kappa \begin{pmatrix} 3 \\ 2 \\ -2 \end{pmatrix} \tag{1}$$

$$= \begin{pmatrix} 1 + 3\kappa \\ 2 + 2\kappa \\ 3 - 2\kappa \end{pmatrix}. \tag{2}$$

Hence the parametric equations of the line are

$$x = 1 + 3\kappa, \tag{3}$$
$$y = 2 + 2\kappa, \tag{4}$$
$$z = 3 - 2\kappa, \quad \kappa \in \mathbb{R}. \tag{5}$$

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

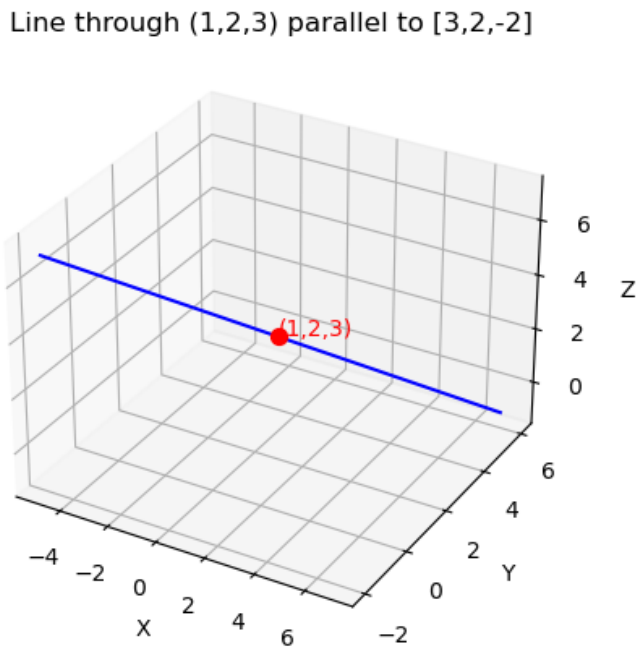

Figure 1: 3D plot of the line