

4.5.7

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Question

The equation of a line, which is parallel to $2\hat{i} + \hat{j} + 3\hat{k}$ and passes through the point $(5, -2, 4)$ is

$$\frac{x-5}{2} = \frac{y+2}{-1} = \frac{z-4}{3}.$$

Solution

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

$$\mathbf{h} = \begin{pmatrix} 5 \\ -2 \\ 4 \end{pmatrix}, \quad \mathbf{m} = \begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix}.$$

The vector equation of the line is given by

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

Solution

Expanding,

$$\mathbf{x} = \begin{pmatrix} 5 \\ -2 \\ 4 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix} \quad (1)$$

$$= \begin{pmatrix} 5 + 2\lambda \\ -2 + \lambda \\ 4 + 3\lambda \end{pmatrix}. \quad (2)$$

Hence the parametric equations of the line are

$$x = 5 + 2\lambda, \quad (3)$$

$$y = -2 + \lambda, \quad (4)$$

$$z = 4 + 3\lambda, \quad \lambda \in \mathbb{R}. \quad (5)$$

Solution

Therefore, the symmetric form of the line is

$$\boxed{\frac{x-5}{2} = \frac{y+2}{1} = \frac{z-4}{3}}.$$

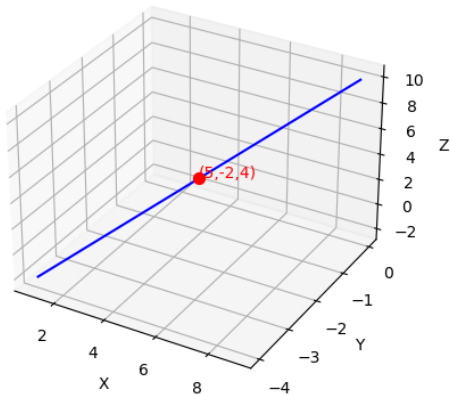
Which is different from the equation in the question:

$$\frac{x-5}{2} = \frac{y+2}{-1} = \frac{z-4}{3}$$

Hence, the statement:

The equation of a line, which is parallel to $2\hat{i} + \hat{j} + 3\hat{k}$ and passes through the point $(5, -2, 4)$ is $\frac{x-5}{2} = \frac{y+2}{-1} = \frac{z-4}{3}$ is **False**.

Line through $(5, -2, 4)$ parallel to $[2, 1, 3]$



For Codes, refer to the URL below:

<https://github.com/Aditya-Mishra11005/ee1030-2025/tree/main/ee25btech11005/matgeo/4.5.7/Codes>