

## 4.3.9

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**Question:** The vector equation of the line  $\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$  is?

**Solution:**

Given:

$$\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2} \quad (0.1)$$

Let  $\mathbf{A}$  be the parallel vector of the given line.

Let  $\mathbf{B}$  be the position vector of a point on the given line.

From Equation 0.1,

$$\mathbf{A} = \begin{pmatrix} 3 \\ 7 \\ 2 \end{pmatrix} \quad (0.2)$$

Putting  $x=8$  in Equation 0.1 to get an arbitrary point on the line,

$$\frac{8-5}{3} = \frac{y+4}{7} = \frac{z-6}{2} \Rightarrow x=8, y=3, z=8. \quad (0.3)$$

$$\therefore \mathbf{B} = \begin{pmatrix} 8 \\ 3 \\ 8 \end{pmatrix} \quad (0.4)$$

From Equations 0.1 and 0.4,

The Vector Equation of the given line is:

$$\mathbf{L} = \mathbf{B} + k\mathbf{A}, \text{ Where } k \text{ is a real parameter OR } k \in \mathbb{R} \quad (0.5)$$

$$\boxed{\mathbf{L} = \begin{pmatrix} 8 \\ 3 \\ 8 \end{pmatrix} + k \begin{pmatrix} 3 \\ 7 \\ 2 \end{pmatrix}} \quad (0.6)$$

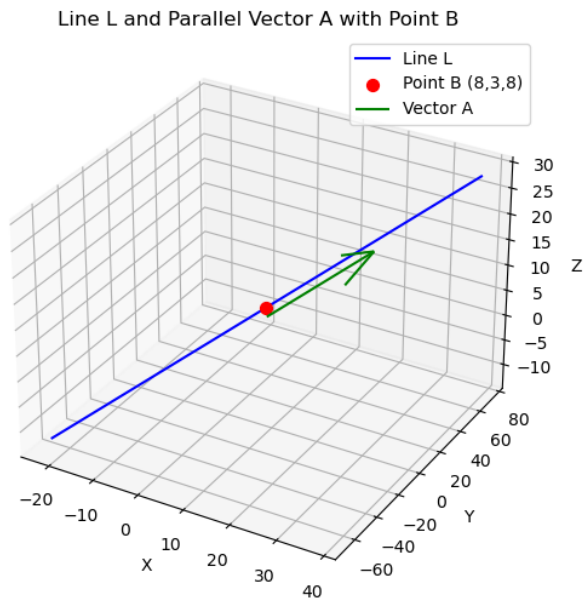


Fig. 0.1: Line