4.3.40

EE25BTECH11050-Hema Havil

Question:

Find the equation of the line that passes through the point with position vector $2\hat{i}-\hat{j}+4\hat{k}$ and is in direction $\hat{i}+2\hat{j}-\hat{k}$.

Solution:

Given,

the point on the line,

$$\mathbf{r_0} = \begin{pmatrix} 2 \\ -1 \\ 4 \end{pmatrix} \tag{0.1}$$

the direction vector of the line,

$$\mathbf{d} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \tag{0.2}$$

Let the position vector of any point on the line be $\mathbf{r_t}$ then,

$$\mathbf{r_t} = \mathbf{r_0} + t\mathbf{d} \tag{0.3}$$

$$\mathbf{r_t} = \begin{pmatrix} 2+t \\ -1+2t \\ 4+-t \end{pmatrix} \tag{0.4}$$

where t is the parameter,

Therefore the equation of the line is

$$\mathbf{r_t} = \begin{pmatrix} 2+t \\ -1+2t \\ 4+-t \end{pmatrix} \tag{0.5}$$

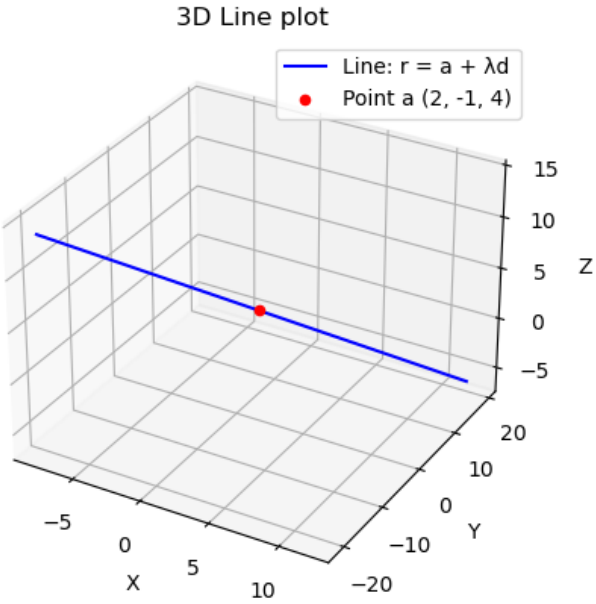

Fig. 0.1: Plot of the 3D line