

AI1110 Assignment 2

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The Cartesian equation of a line is: $2x - 3 = 3y + 1 = 5 - 6z$. Find the vector equation of a line passing through $(7, -5, 0)$ and parallel to the given line.

Solution:

The given cartesian equation of the line is $2x - 3 = 3y + 1 = 5 - 6z$. This line can be expressed in vector form as

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

A line which is parallel to the given line has the same direction vector as that of the given line. It is given that the required line passes through $(7, -5, 0)$. Let,

$$\mathbf{P} = \begin{pmatrix} 7 \\ -5 \\ 0 \end{pmatrix} \quad (2)$$

$$\mathbf{m} = \begin{pmatrix} 3 \\ 2 \\ -1 \end{pmatrix} \quad (3)$$

Hence, the vector equation of the required line is

$$\mathbf{x} = \mathbf{P} + \lambda \mathbf{m} \quad (4)$$

$$\mathbf{x} = \begin{pmatrix} 7 \\ -5 \\ 0 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 2 \\ -1 \end{pmatrix} \quad (5)$$

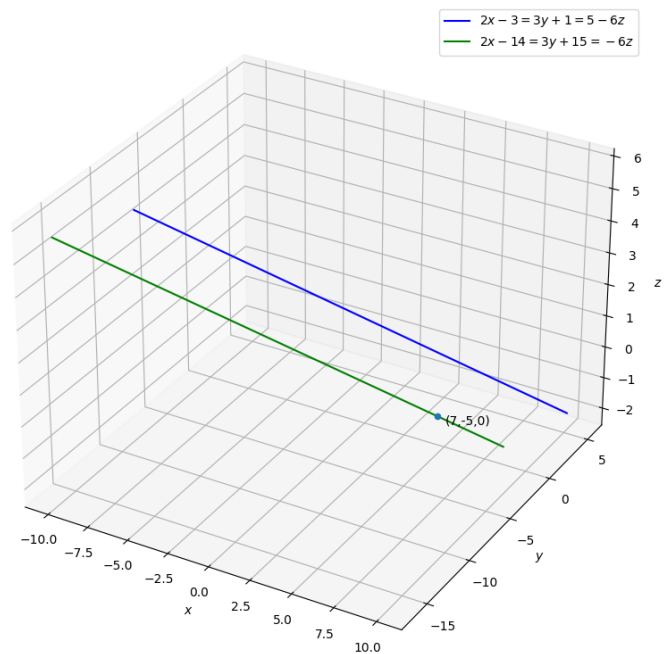


Fig. 1. 3D plot showing the two lines