

ASSIGNMENT 1

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Download all python codes from

<https://github.com/Dishank422/EE3900/blob/main/assignment1/codes/codes.py>

and latex-tikz codes from

<https://github.com/Dishank422/EE3900/blob/main/assignment1/Assignment1.tex>

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 4 \\ 2 \\ 6 \end{pmatrix}, \mathbf{C} - \mathbf{B} = \begin{pmatrix} 6 \\ 3 \\ 9 \end{pmatrix} \quad (2.0.8)$$

$$\Rightarrow 2\sqrt{14} = \lambda \times 3\sqrt{14} \quad (2.0.9)$$

$$\Rightarrow \lambda = \frac{2}{3} \quad (2.0.10)$$

Thus \mathbf{B} divides AC in the ratio 2:3.

1 VECTORS 2.13

Show that the points $\mathbf{A} = \begin{pmatrix} 1 \\ -2 \\ -8 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} 5 \\ 0 \\ -2 \end{pmatrix}$ and

$\mathbf{C} = \begin{pmatrix} 11 \\ 3 \\ 7 \end{pmatrix}$ are collinear and find the ratio in which \mathbf{B} divides AC .

2 SOLUTION

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 4 \\ 2 \\ 6 \end{pmatrix}, \mathbf{C} - \mathbf{A} = \begin{pmatrix} 10 \\ 5 \\ 15 \end{pmatrix} \quad (2.0.1)$$

Forming the matrix M ,

$$M = \begin{pmatrix} \mathbf{B} - \mathbf{A} & \mathbf{C} - \mathbf{A} \end{pmatrix}^T \quad (2.0.2)$$

$$= \begin{pmatrix} 4 & 2 & 6 \\ 10 & 5 & 15 \end{pmatrix} \quad (2.0.3)$$

Using matrix transformation,

$$M = \begin{pmatrix} 4 & 2 & 6 \\ 10 & 5 & 15 \end{pmatrix} \xrightarrow{R_2 \rightarrow R_2 - \frac{5}{2}R_1} \begin{pmatrix} 4 & 2 & 6 \\ 0 & 0 & 0 \end{pmatrix} \quad (2.0.4)$$

$$\Rightarrow \text{rank}(M) = 1 \quad (2.0.5)$$

Thus \mathbf{A} , \mathbf{B} and \mathbf{C} are collinear.

Let \mathbf{B} divide AC in the ratio $\lambda : 1$.

$$\Rightarrow \frac{\lambda}{1} = \frac{AB}{BC} \quad (2.0.6)$$

$$\Rightarrow \|\mathbf{B} - \mathbf{A}\| = \lambda \|\mathbf{C} - \mathbf{B}\| \quad (2.0.7)$$

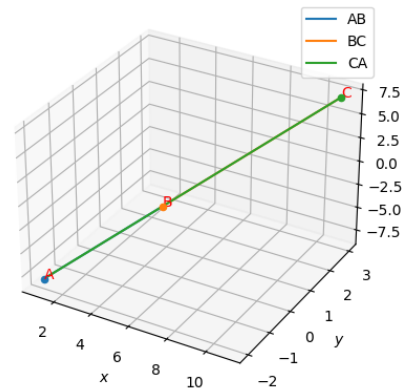


Fig. 0: Plot of the line