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Assignment - Vector-4

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I. PROBLEM

Determine the ratio in which the line 2x+y–4=0 divides the line segment joining the points A(2,–2) and B(3,7).

II. SOLUTION

Given L_1 points we get the equation

$$\mathbf{A} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}; \mathbf{B} = \begin{pmatrix} 3 \\ 7 \end{pmatrix} \tag{1}$$

$$-9\mathbf{x} + \mathbf{y} + 20 = 0 - - - (L_1) \tag{2}$$

Given L_2 equation

$$2\mathbf{x} + \mathbf{y} - 4 = 0 - - - (L_1) \tag{3}$$

Intersection point of L_1 and L_2

$$\mathbf{n_1}^T\mathbf{X} = \mathbf{C}_1 \tag{4}$$

$$\mathbf{n_2}^T\mathbf{X} = \mathbf{C}_2 \tag{5}$$

$$\begin{pmatrix} \mathbf{n}_1^T \\ \mathbf{n}_2^T \end{pmatrix} \mathbf{X} = \begin{pmatrix} \mathbf{c}_1 \\ \mathbf{c}_2 \end{pmatrix} \tag{6}$$

$$\mathbf{X} = \begin{pmatrix} \mathbf{n}_1 \\ \mathbf{n}_2 \end{pmatrix}^T \begin{pmatrix} \mathbf{c}_1 \\ \mathbf{c}_2 \end{pmatrix} \tag{7}$$

$$= \begin{pmatrix} \frac{1}{11} & \frac{1}{11} \\ \frac{-2}{11} & \frac{9}{11} \end{pmatrix} \begin{pmatrix} 20 \\ 4 \end{pmatrix} \tag{8}$$

$$= \begin{pmatrix} \frac{24}{11} \\ \frac{-4}{11} \end{pmatrix} \tag{9}$$

Let the ratio be k:1 and P be the point where lines intersect.
Using section formula

$$\mathbf{P} = \frac{k\mathbf{B} + \mathbf{A}}{k+1} \tag{10}$$

$$\frac{1}{11}\begin{pmatrix} 24 \\ -4 \end{pmatrix} = \frac{k\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ -2 \end{pmatrix}}{k+1} \tag{11}$$

$$\frac{24}{11} = \begin{pmatrix} 3k+2 \\ 7k-2 \end{pmatrix} \frac{1}{k+1} \tag{12}$$

$$\frac{24}{11} = \frac{3k+2}{k+1} \tag{13}$$

$$24k + 24 = 33k + 22 \tag{14}$$

$$9k = 2 \tag{15}$$

$$k = \frac{2}{9} \tag{16}$$

III. CODE LINK

https://github.com/sssurajit/fwc/blob/main/vector/vector–4/codes/vector.py

Execute the code by using the command
python3 vector.py

IV. FIGURE

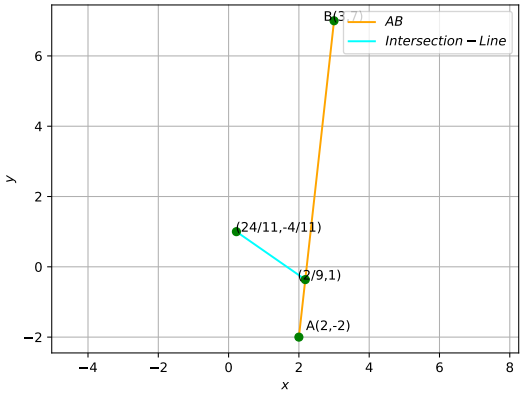

Fig. 1