भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Assignment - Vector-4

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CONTENTS

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

Symbol	Value
$\mathbf{A}$	$\begin{pmatrix}2\\-2\end{pmatrix}$
$\mathbf{B}$	$\begin{pmatrix}3\\7\end{pmatrix}$
c	4
$\mathbf{P}$	$\frac{k\mathbf{B}+\mathbf{A}}{k+1}$
$\mathbf{n}$	$\begin{pmatrix}2\\1\end{pmatrix}$

TABLE I: Parameters

Given equation

$$\begin{pmatrix}2\\1\end{pmatrix}^{\top}\mathbf{x}-4=0 \tag{1}$$

using section formula
Let the ratio be k:1

$$\mathbf{n}^{\top}\mathbf{P}=c \tag{2}$$
$$\implies \mathbf{n}^{\top}\left(\tfrac{k\mathbf{B}+\mathbf{A}}{k+1}\right)=c \tag{3}$$
$$\implies \mathbf{n}^{\top}\left(k\mathbf{B}+\mathbf{A}\right)=c\left(k+1\right) \tag{4}$$
$$\implies \mathbf{n}^{\top}k\mathbf{B}+\mathbf{n}^{\top}\mathbf{A}=c\left(k+1\right) \tag{5}$$
$$\implies k\mathbf{n}^{\top}\mathbf{B}+\mathbf{n}^{\top}\mathbf{A}=c\left(k+1\right) \tag{6}$$
$$\implies k\mathbf{n}^{\top}\mathbf{B}-ck=-\mathbf{n}^{\top}\mathbf{A}+c \tag{7}$$
$$\implies k\left(\mathbf{n}^{\top}\mathbf{B}-c\right)=c-\mathbf{n}^{\top}\mathbf{A} \tag{8}$$
$$\implies k=\frac{c-\mathbf{n}^{\top}\mathbf{A}}{\mathbf{n}^{\top}\mathbf{B}-c} \tag{9}$$
$$\implies k=\frac{4-2}{13-4} \tag{10}$$
$$\implies k=\frac{2}{9} \tag{11}$$

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

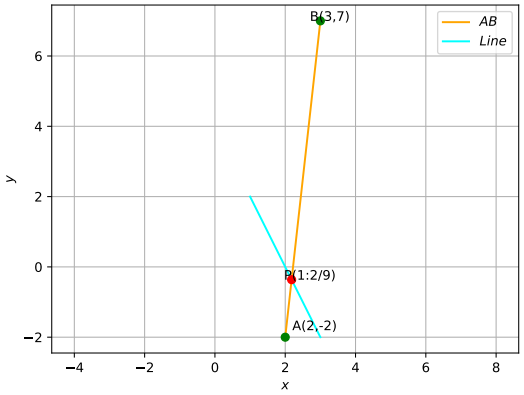

Fig. 1