1.4.3

AI25BTECH11033- Spoorthi N

Question:
Find the ratio in which the point $\mathbf{P}\left(\frac{3}{4}, \frac{5}{12}\right)$ divides the line segment joining the points $\mathbf{A}\left(\frac{1}{2}, \frac{3}{2}\right)$ and $\mathbf{B}\,(2, -5)$

Solution:
Let us solve the given equation theoretically and then verify the solution computationally
According to the question,
Now

$$\mathbf{P} = \begin{pmatrix} \frac{3}{4} \\ \frac{5}{12} \end{pmatrix}, \mathbf{A} = \begin{pmatrix} \frac{1}{2} \\ \frac{3}{2} \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \tag{1}$$

Let $\mathbf{P}$ divide $\mathbf{A}$ and $\mathbf{B}$ in $k : 1$
We know that

$$k = \frac{\left(A - P\right)^T \left(P - B\right)}{\|\mathbf{P} - \mathbf{B}\|^2} \tag{2}$$

$$k = \frac{\begin{pmatrix} \frac{-1}{4} & \frac{13}{12} \end{pmatrix} \begin{pmatrix} \frac{-5}{4} \\ \frac{65}{12} \end{pmatrix}}{(\frac{-5}{4})^2 + (\frac{65}{12})^2} \tag{3}$$

$$K = \frac{(\frac{-1}{4})(\frac{-5}{4}) + (\frac{13}{12})(\frac{65}{12})}{\frac{25}{16} + \frac{4225}{144}} \tag{4}$$

$$K = \frac{(\frac{5}{16}) + (\frac{845}{144})}{(\frac{4225+225}{144})} \tag{5}$$

$$K = 1/5 \tag{6}$$

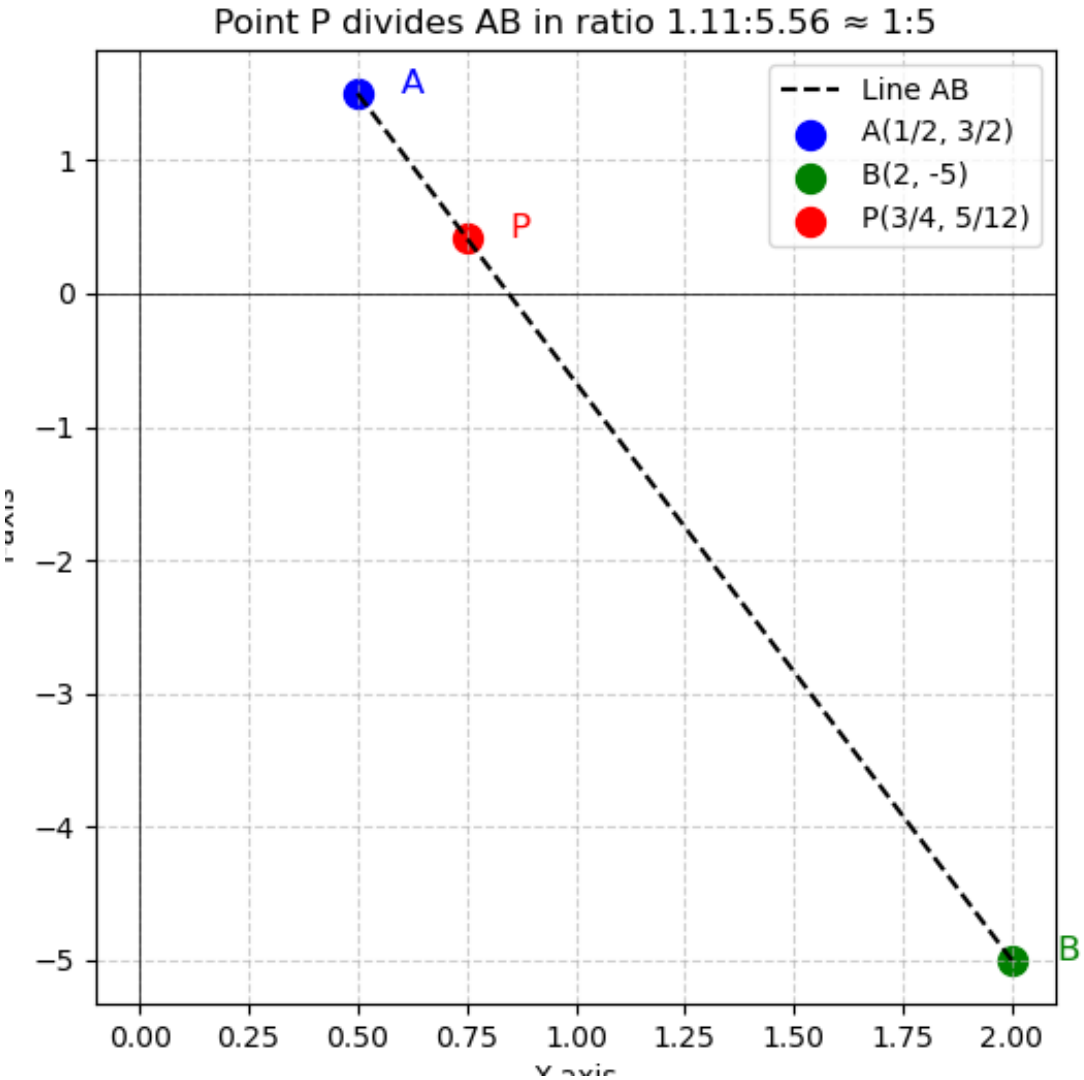
Point P divides AB in ratio 1.11:5.56 ≈ 1:5
A
P
B
Line AB
A(1/2, 3/2)
B(2, -5)
P(3/4, 5/12)
1
0
−1
−2
−3
−4
−5
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00

Fig. 1