

## 1.4.3

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**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

$$\mathbf{P} = \left( \frac{3}{4}, \frac{5}{12} \right), \mathbf{A} = \left( \frac{1}{2}, \frac{3}{2} \right), \mathbf{B} = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \quad (0.1)$$

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

We know that

$$k = \frac{(\mathbf{A} - \mathbf{P})^T (\mathbf{P} - \mathbf{B})}{\|\mathbf{P} - \mathbf{B}\|^2} \quad (0.2)$$

$$k = \frac{\begin{pmatrix} -\frac{1}{4} & \frac{13}{12} \end{pmatrix} \begin{pmatrix} -\frac{5}{4} \\ \frac{65}{12} \end{pmatrix}}{\left(-\frac{5}{4}\right)^2 + \left(\frac{65}{12}\right)^2} \quad (0.3)$$

$$K = \frac{\left(-\frac{1}{4}\right)\left(-\frac{5}{4}\right) + \left(\frac{13}{12}\right)\left(\frac{65}{12}\right)}{\frac{25}{16} + \frac{4225}{144}} \quad (0.4)$$

$$K = \frac{\left(\frac{5}{16}\right) + \left(\frac{845}{144}\right)}{\left(\frac{4225+225}{144}\right)} \quad (0.5)$$

$$K = 1/5 \quad (0.6)$$

# Graphical Representation

