1.4.18

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Question

Show that **P**(5,-3) is the point of trisection of the line segment that join the points **A** (7,-2) and **B** (1,-5).

formula

D divides BC in the ratio $k : 1$,

$$\mathbf{D} = \frac{k\mathbf{C} + \mathbf{B}}{k + 1} \tag{1}$$

Theoretical Solution

$$\text{Let } \mathbf{A} = \begin{pmatrix} 7 \\ -2 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 1 \\ -5 \end{pmatrix} \tag{2}$$

Point P (Further to A , Ratio 2 : 1):

$$\mathbf{P} = \begin{pmatrix} \mathbf{A} & \mathbf{B} \end{pmatrix} \begin{pmatrix} \frac{2}{3} \\ \frac{1}{3} \end{pmatrix} \tag{3}$$

$$\implies \mathbf{P} = \begin{pmatrix} 7 & 1 \\ -2 & -5 \end{pmatrix} \begin{pmatrix} \frac{2}{3} \\ \frac{1}{3} \end{pmatrix} \tag{4}$$

$$\tag{5}$$

$$\mathbf{P} = \begin{pmatrix} \frac{1\times1+2\times7}{3} \\ \frac{1\times-5+2\times(-2)}{3} \end{pmatrix} = \begin{pmatrix} 5 \\ -3 \end{pmatrix} \tag{6}$$

Point Q (Nearer from A, Ratio 1 : 2):

$$\mathbf{Q} = \begin{pmatrix} \mathbf{A} & \mathbf{B} \end{pmatrix} \begin{pmatrix} \frac{1}{3} \\ \frac{2}{3} \end{pmatrix} \tag{7}$$

$$\implies \mathbf{Q} = \begin{pmatrix} 7 & 1 \\ -2 & -5 \end{pmatrix} \begin{pmatrix} \frac{1}{3} \\ \frac{2}{3} \end{pmatrix} \tag{8}$$

$$\tag{9}$$

$$\mathbf{Q} = \begin{pmatrix} \frac{2\times1+1\times7}{3} \\ \frac{2\times(-5)+1\times(-2)}{3} \end{pmatrix} = \begin{pmatrix} 3 \\ -4 \end{pmatrix} \tag{10}$$

$$\mathbf{P} = \begin{pmatrix} 5 \\ -3 \end{pmatrix} \quad \mathbf{Q} = \begin{pmatrix} 3 \\ -4 \end{pmatrix} \tag{11}$$

Graph of the line segment AB with trisection points P and Q

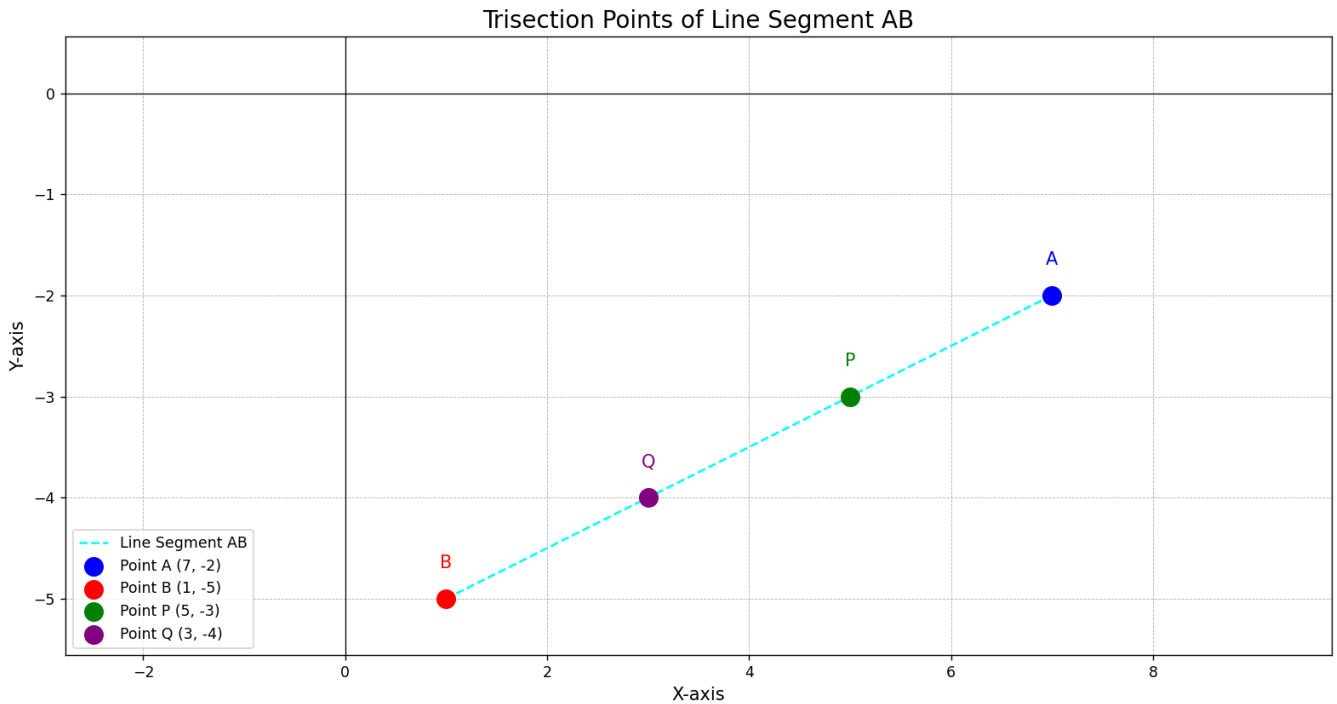

Figure: Figure for 1.4.18