

Assignment 1

Anjali Bagade, EE21MTECH11001

vector

Abstract—This document contains the solution to find Internally and externally divided coordinate points.

Download all python codes from

<https://github.com/Anjalibagade/EE5600/tree/master/Assignment1>

and latex codes from

<https://github.com/Anjalibagade/EE5600/Assignment1>

Problem

Vector-2, Example-1, Question-18

Find the coordinates of the point which divides, internally and externally, the line joining $(-3, -4)$ to $(-8, 7)$ in the ratio $7:5$

Solution:

1) Finding internal coordinate point :

Let us consider \mathbf{P} is a vector which divides \mathbf{A} and \mathbf{B} in the ratio of $7:5$ gives internally divided point.

Given that,

$$\mathbf{A} = \begin{pmatrix} -3 \\ -4 \end{pmatrix} \quad (0.0.1)$$

$$\mathbf{B} = \begin{pmatrix} -8 \\ 7 \end{pmatrix} \quad (0.0.2)$$

$$\frac{\mathbf{PA}}{\mathbf{BP}} = \frac{7}{5} \quad (0.0.3)$$

$$\Rightarrow 5\mathbf{PA} = 7\mathbf{BP} \quad (0.0.4)$$

$$5(\mathbf{P} - \mathbf{A}) = 7(\mathbf{B} - \mathbf{P}) \quad (0.0.5)$$

On solving above equation we get,

$$\Rightarrow 12\mathbf{P} = 5\mathbf{A} + 7\mathbf{B} \quad (0.0.6)$$

$$\Rightarrow \mathbf{P} = \frac{5}{12}\mathbf{A} + \frac{7}{12}\mathbf{B} \quad (0.0.7)$$

$$\mathbf{P} = \frac{5}{12} \begin{pmatrix} -3 \\ -4 \end{pmatrix} + \frac{7}{12} \begin{pmatrix} -8 \\ 7 \end{pmatrix} \quad (0.0.8)$$

$$\mathbf{P} = \begin{pmatrix} \frac{-15}{12} \\ \frac{-20}{12} \end{pmatrix} + \begin{pmatrix} \frac{-56}{12} \\ \frac{49}{12} \end{pmatrix} \quad (0.0.9)$$

Solving above equation we get internally divided coordinate point

$$\mathbf{P} = \begin{pmatrix} \frac{-71}{12} \\ \frac{29}{12} \end{pmatrix} \quad (0.0.10)$$

2) Finding external coordinate point :

Let us consider \mathbf{P} is a vector which divides \mathbf{A} and \mathbf{B} in the ratio of $7:5$ gives externally divided point.

$$\frac{\mathbf{AP}}{\mathbf{BP}} = \frac{7}{5} \quad (0.0.11)$$

$$\Rightarrow 5\mathbf{AP} = 7\mathbf{BP} \quad (0.0.12)$$

$$5(\mathbf{A} - \mathbf{P}) = 7(\mathbf{B} - \mathbf{P}) \quad (0.0.13)$$

Solving above equation

$$\Rightarrow 2\mathbf{P} = 7\mathbf{B} - 5\mathbf{A} \quad (0.0.14)$$

$$\Rightarrow \mathbf{P} = \frac{7}{2}\mathbf{B} - \frac{5}{2}\mathbf{A} \quad (0.0.15)$$

$$\mathbf{P} = \frac{7}{2} \begin{pmatrix} -8 \\ 7 \end{pmatrix} - \frac{5}{2} \begin{pmatrix} -3 \\ -4 \end{pmatrix} \quad (0.0.16)$$

$$\mathbf{P} = \begin{pmatrix} \frac{-56}{2} \\ \frac{49}{2} \end{pmatrix} + \begin{pmatrix} \frac{15}{2} \\ \frac{-20}{2} \end{pmatrix} \quad (0.0.17)$$

Solving above equation we get externally divided coordinate point

$$\mathbf{P} = \begin{pmatrix} \frac{-41}{2} \\ \frac{69}{2} \end{pmatrix} \quad (0.0.18)$$

Result

Plot of coordinate of the points obtained from Python code is shown below.

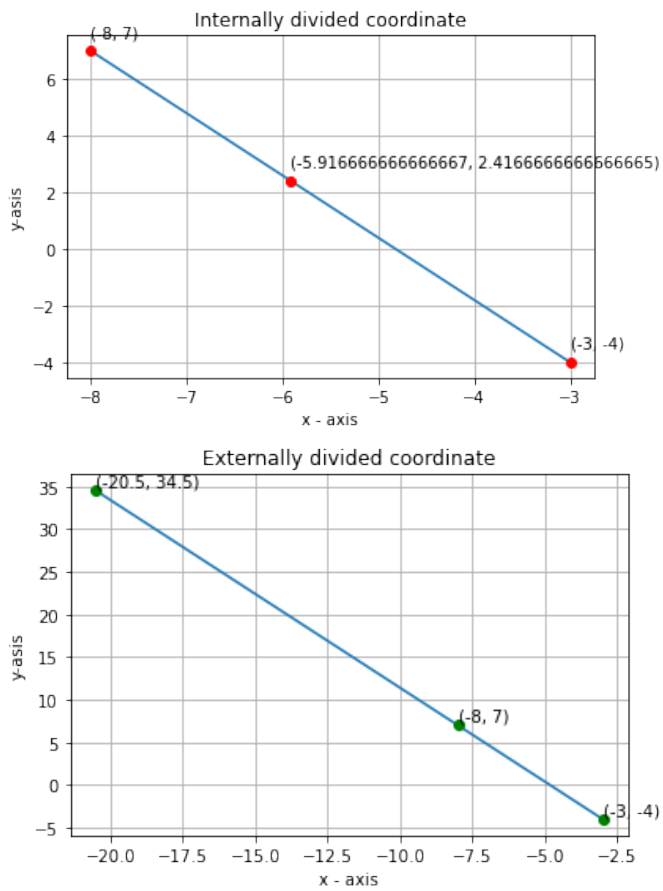


Fig. 2: Plot of coordinate of the point which divides internally and externally