Assignment 1

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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 **P** is a vector which divides **A** and **B** in the ratio of 7:5 gives internally divided point.
Given that,

$$\mathbf{A} = \begin{pmatrix} -3 \\ -4 \end{pmatrix} \tag{0.0.1}$$

$$\mathbf{B} = \begin{pmatrix} -8 \\ 7 \end{pmatrix} \tag{0.0.2}$$

$$\frac{\mathbf{PA}}{\mathbf{BP}} = \frac{7}{5} \tag{0.0.3}$$

$$\implies 5\mathbf{PA} = 7\mathbf{BP} \tag{0.0.4}$$

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

On solving above equation we get,

$$\implies 12\mathbf{P} = 5\mathbf{A} + 7\mathbf{B} \tag{0.0.6}$$

$$\implies \mathbf{P} = \frac{5}{12}\mathbf{A} + \frac{7}{12}\mathbf{B} \tag{0.0.7}$$

$$\mathbf{p} = \begin{pmatrix} \mathbf{A} & \mathbf{B} \end{pmatrix} \begin{pmatrix} \frac{5}{12} \\ \frac{7}{12} \end{pmatrix} \tag{0.0.8}$$

$$\mathbf{P} = \begin{pmatrix} -3 & -8 \\ -4 & 7 \end{pmatrix} \begin{pmatrix} \frac{5}{12} \\ \frac{7}{12} \end{pmatrix} \tag{0.0.9}$$

$$\implies \begin{pmatrix} \frac{5(-3)+7(-8)}{12} \\ \frac{5(-4)+7(7)}{12} \end{pmatrix} \tag{0.0.10}$$

$$\mathbf{p} = \begin{pmatrix} \frac{(-15)+(-56)}{12} \\ \frac{(-20)+49}{12} \end{pmatrix} \tag{0.0.11}$$

Solving above equation we get internally divided coordinate point

$$\mathbf{P} = \begin{pmatrix} \frac{-71}{12} \\ \frac{29}{12} \end{pmatrix} \tag{0.0.12}$$

2) **Finding external coordinate point :**
Let us consider **P** is a vector which divides **A** and **B** in the ratio of 7:5 gives externally divided point.

$$\frac{\mathbf{AP}}{\mathbf{BP}} = \frac{7}{5} \tag{0.0.13}$$

$$\implies 5\mathbf{AP} = 7\mathbf{BP} \tag{0.0.14}$$

$$5(\mathbf{A} - \mathbf{P}) = 7(\mathbf{B} - \mathbf{P}) \tag{0.0.15}$$

Solving above equation

$$\implies 2\mathbf{P} = 7\mathbf{B} - 5\mathbf{A} \tag{0.0.16}$$

$$\implies \mathbf{P} = \frac{7}{2}\mathbf{B} - \frac{5}{2}\mathbf{A} \tag{0.0.17}$$

$$\mathbf{p} = \begin{pmatrix} \mathbf{B} & \mathbf{A} \end{pmatrix} \begin{pmatrix} \frac{7}{2} \\ \frac{-5}{2} \end{pmatrix} \tag{0.0.18}$$

$$\mathbf{P} = \begin{pmatrix} -8 & -3 \\ 7 & -4 \end{pmatrix} \begin{pmatrix} \frac{7}{2} \\ \frac{-5}{2} \end{pmatrix} \tag{0.0.19}$$

$$\implies \begin{pmatrix} \frac{7(-8)-5(-3)}{2} \\ \frac{7(7)-5(-4)}{2} \end{pmatrix} \tag{0.0.20}$$

$$\mathbf{p} = \begin{pmatrix} \frac{(-56)+15}{2} \\ \frac{49+20}{2} \end{pmatrix} \tag{0.0.21}$$

Solving above equation we get externally divided coordinate point

$$\mathbf{P} = \begin{pmatrix} \frac{-41}{2} \\ \frac{69}{2} \end{pmatrix} \tag{0.0.22}$$

Result

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

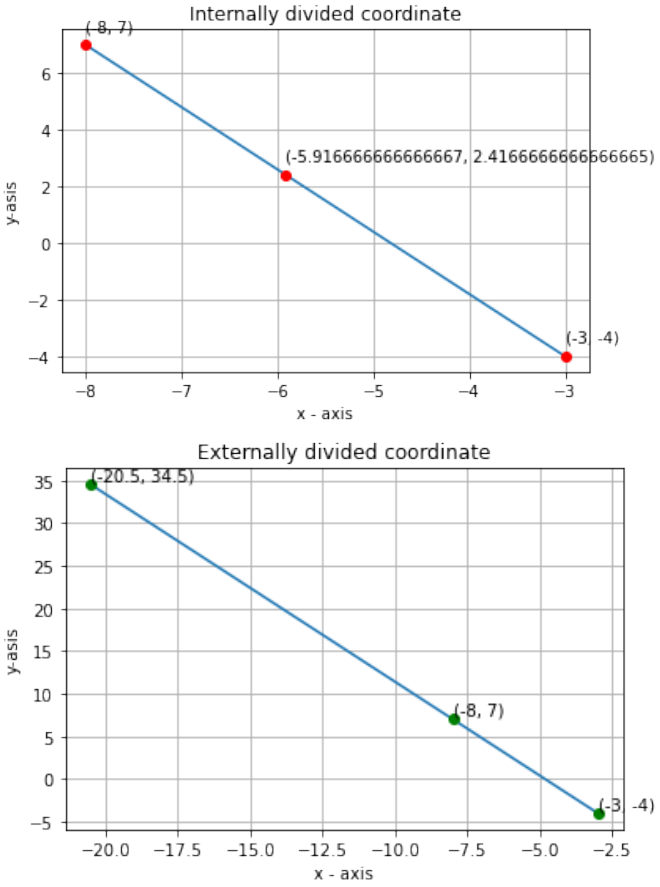

Fig. 2: Plot of coordinate of the point which divides internally and externally