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/Codes

and latex codes from

https://github.com/Anjalibagade/EE5600

Problem (1.8)

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

Explaination

1.Finding internal coordinate point

Let us consider $\overrightarrow{OP}$ is a vector which divides $\overrightarrow{OA}$ and $\overrightarrow{OB}$ in the ratio of 7:5 gives internally divided point.

Given that

$$\overrightarrow{OA} = \begin{bmatrix} -3 & -4 \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.1}$$

$$\overrightarrow{OB} = \begin{bmatrix} -8 & 7 \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.2}$$

We can write

$$\frac{AP}{BP} = \frac{7}{5} \tag{0.0.3}$$

$$5AP = 7BP \tag{0.0.4}$$

$$5(\overrightarrow{OP} - \overrightarrow{OA}) = 7(\overrightarrow{OB} - \overrightarrow{OP}) \tag{0.0.5}$$

On solving above equation we get,

$$\implies 12(\overrightarrow{OP}) = 5(\overrightarrow{OA}) + 7((\overrightarrow{OB}) \tag{0.0.6}$$

$$\implies (\overrightarrow{OP}) = \frac{5}{12}(\overrightarrow{OA}) + \frac{7}{12}((\overrightarrow{OB}) \tag{0.0.7}$$

$$\overrightarrow{OP} = \frac{5}{12}\begin{bmatrix} -3 & -4 \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} + \frac{7}{12}\begin{bmatrix} -8 & -7 \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.8}$$

$$\overrightarrow{OP} = \begin{bmatrix} \frac{-15}{12} & \frac{-56}{12} \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} + \begin{bmatrix} \frac{-20}{12} & \frac{47}{12} \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.9}$$

Solving above equation we get internally divided coordinate point

$$\overrightarrow{OP} = \begin{bmatrix} \frac{-71}{12} & \frac{29}{12} \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.10}$$

2.Finding external coordinate point

Let us consider $\overrightarrow{OP}$ is a vector which divides $\overrightarrow{OA}$ and $\overrightarrow{OB}$ in the ratio of 7:5 gives externally divided point.

$$5(\overrightarrow{OA} - \overrightarrow{OP}) = 7(\overrightarrow{OB} - \overrightarrow{OP}) \tag{0.0.11}$$

Solving above equation

$$\implies 2(\overrightarrow{OP}) = 7(\overrightarrow{OB}) - 5((\overrightarrow{OA}) \tag{0.0.12}$$

$$\implies (\overrightarrow{OP}) = \frac{7}{2}(\overrightarrow{OB}) - \frac{5}{2}((\overrightarrow{OA}) \tag{0.0.13}$$

$$\overrightarrow{OP} = \frac{7}{2}\begin{bmatrix} -8 & 7 \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} + \frac{5}{2}\begin{bmatrix} -3 & -4 \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.14}$$

$$\overrightarrow{OP} = \begin{bmatrix} \frac{-56}{2} & \frac{15}{2} \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} + \begin{bmatrix} \frac{49}{2} & \frac{-20}{2} \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.15}$$

Solving above equation we get externally divided coordinate point

$$\overrightarrow{OP} = \begin{bmatrix} \frac{-41}{2} & \frac{69}{2} \end{bmatrix} \begin{bmatrix} \hat{i} \\ \hat{j} \end{bmatrix} \tag{0.0.16}$$

Result

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

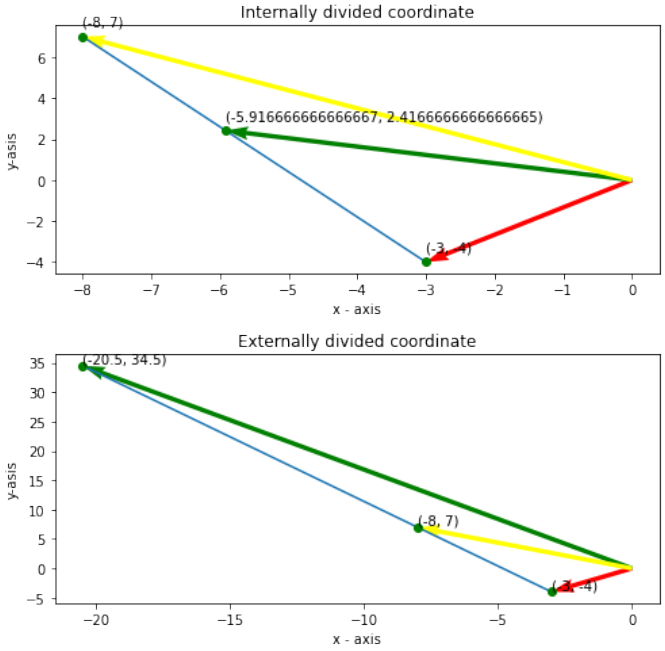

Fig. 0: Plot of coordinate of the point which divides internally and externally