Coordinate Calculation for Point Dividing a Line Segment

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Question:
Find the coordinate of the point which divides the line segment joining points $A(4,-3)$ and $B(8,5)$ in the ratio $3:1$ internally.

Solution:
Let O be the origin. Then the position vectors

$$\overrightarrow{OA} = \begin{bmatrix} 4 \\ -3 \end{bmatrix}, \quad \overrightarrow{OB} = \begin{bmatrix} 8 \\ 5 \end{bmatrix}.$$

The point C, dividing the segment AB in the ratio $3:1$ internally, has the position vector

$$\overrightarrow{OC} = \frac{3\overrightarrow{OB} + 1\overrightarrow{OA}}{3+1} = \frac{3\begin{bmatrix} 8 \\ 5 \end{bmatrix} + \begin{bmatrix} 4 \\ -3 \end{bmatrix}}{4} = \frac{\begin{bmatrix} 24 \\ 15 \end{bmatrix} + \begin{bmatrix} 4 \\ -3 \end{bmatrix}}{4} = \frac{\begin{bmatrix} 28 \\ 12 \end{bmatrix}}{4} = \begin{bmatrix} 7 \\ 3 \end{bmatrix}.$$

Therefore, the coordinate of point C is $\boxed{(7,3)}$.

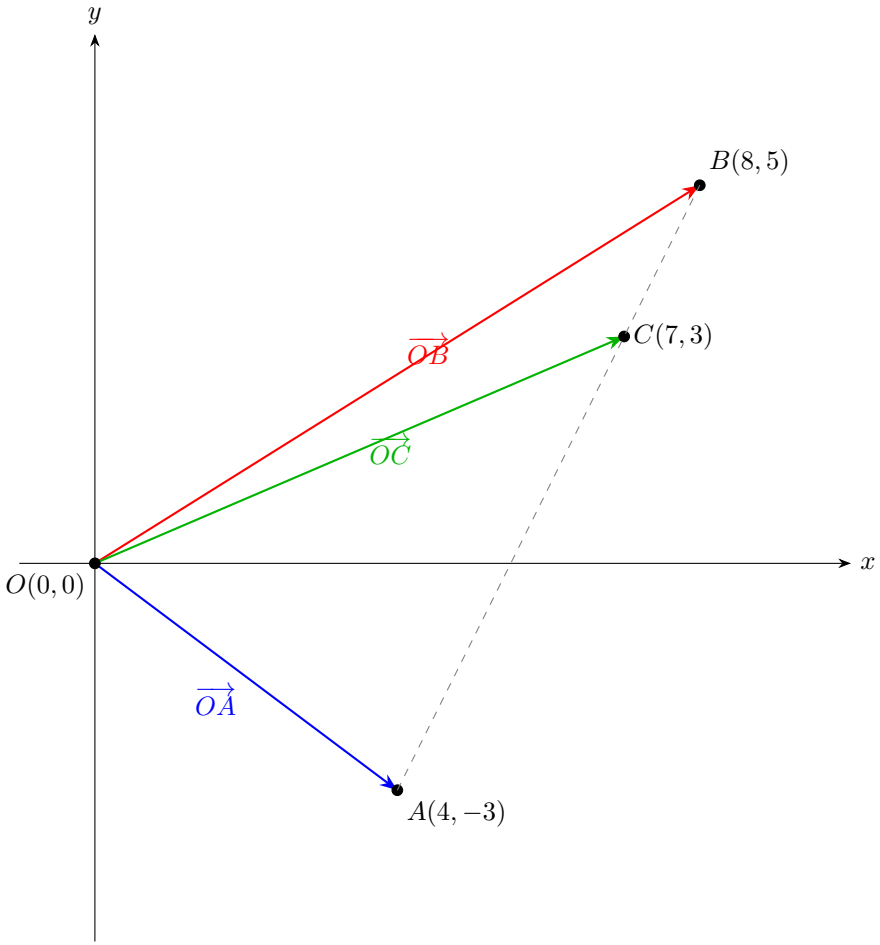
y
x
B(8, 5)
C(7, 3)
$\overrightarrow{OB}$
$\overrightarrow{OC}$
O(0, 0)
$\overrightarrow{OA}$
A(4, −3)

Fig. 1.