## Assignment 1

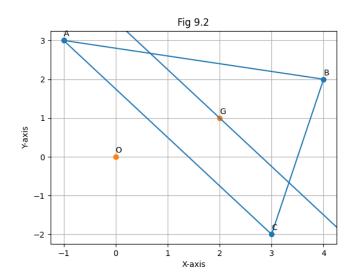
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## Question:

A(-1, 3), B(4,2) and C(3,-2) are the vertices of a triangle.

- (a) Find the coordinates of the centroid G of the triangle
- (b) Find the equation of the line through G and parallel to AC.

## **Solution:**



1. Let  $\vec{A}, \vec{B}, \vec{C}$  be the points vectors OA,OB,OC respectively, where O is the origin. Thus,

$$\vec{A} = \begin{pmatrix} -1\\3 \end{pmatrix}, \vec{B} = \begin{pmatrix} 4\\2 \end{pmatrix}, \vec{C} = \begin{pmatrix} 3\\-2 \end{pmatrix}$$

Using centroid formula, the desired point vector  $\vec{G}$  is given by:

$$\begin{split} \vec{G} &= \frac{1}{3}(\vec{A} + \vec{B} + \vec{C}) \\ &= \frac{1}{3}(\binom{-1}{3} + \binom{4}{2} + \binom{3}{-2}) \\ &= \frac{1}{3}\binom{6}{3} \\ &= \binom{2}{1} \end{split}$$

 $\vec{G}$  is the point vector  $\begin{pmatrix} 2\\1 \end{pmatrix}$ 

2. Let L be the line that passes through G such that L  $\parallel$  AC Then, L can be expressed as  $\vec{G} + k\hat{AC}$ 

$$\hat{AC} = \frac{\vec{C} - \vec{A}}{|\vec{C} - \vec{A}|}$$

$$= \frac{\binom{3}{-2} - \binom{-1}{3}}{|\binom{3}{-2} - \binom{-1}{3}|}$$

$$= \frac{\binom{4}{-5}}{|\binom{4}{-5}|}$$

$$= \frac{\binom{4}{-5}}{\sqrt{41}}$$

$$L = \binom{2}{1} + \frac{k}{\sqrt{41}} \binom{4}{-5}$$

Thus, Line L is  $\binom{2}{1} + m \binom{4}{-5}$