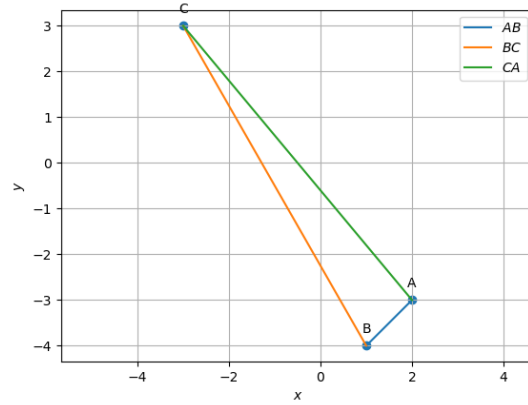# Random vector

A Varun Naik (EE22BTECH11004)

Random vectors obtained

$$\mathbf{A} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}; \mathbf{B} = \begin{pmatrix} 1 \\ -4 \end{pmatrix}; \mathbf{C} = \begin{pmatrix} -3 \\ 3 \end{pmatrix}$$
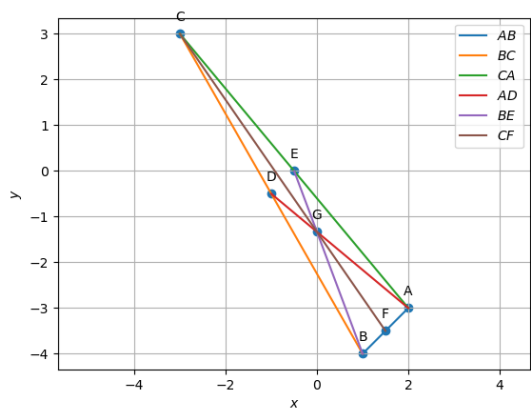
I. VECTORS

Parameters	Values	Description
$\mathbf{m_1}$	$\begin{pmatrix} -1 \\ -1 \end{pmatrix}$	$\mathbf{B} - \mathbf{A}$
$\mathbf{m_2}$	$\begin{pmatrix} -4 \\ 7 \end{pmatrix}$	$\mathbf{C} - \mathbf{B}$
$\mathbf{m_2}$	$\begin{pmatrix} 5 \\ -6 \end{pmatrix}$	$\mathbf{A} - \mathbf{C}$
$\|\mathbf{B} - \mathbf{A}\|$	1.414	length of AB
$\|\mathbf{C} - \mathbf{B}\|$	8.026	length of BC
$\|\mathbf{A} - \mathbf{C}\|$	7.810	length of CA
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	Non-collinear
$\mathbf{n_1}$	$\begin{pmatrix} -1 \\ 1 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_1}$
$\mathbf{n_2}$	$\begin{pmatrix} 7 \\ 4 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_2}$
$\mathbf{n_3}$	$\begin{pmatrix} -6 \\ -5 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_3}$
$\frac{1}{2}\|m_1 \times m_2\|$	5.5	Area
$\angle A$	95.19°	
$\angle B$	74.744°	
$\angle C$	10.06°	

II. MEDIAN

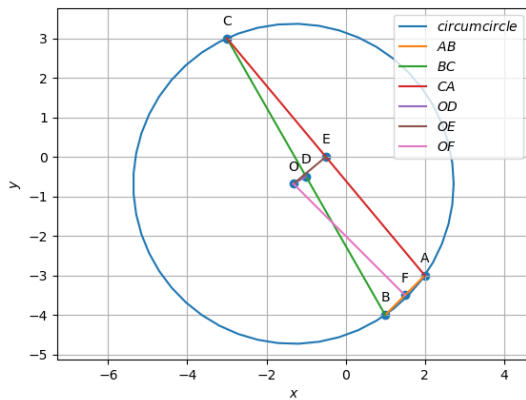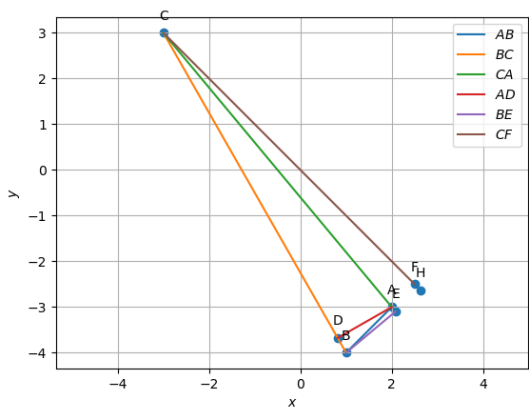| Parameters	Values	Description
D	$\begin{pmatrix} -1 \\ -0.5 \end{pmatrix}$	$\frac{\mathbf{A+B}}{2}$
E	$\begin{pmatrix} -0.5 \\ 0 \end{pmatrix}$	$\frac{\mathbf{C+A}}{2}$
F	$\begin{pmatrix} 1.5 \\ -3.5 \end{pmatrix}$	$\frac{\mathbf{B+C}}{2}$
$\mathbf{m_4}$	$\begin{pmatrix} -3 \\ 2.5 \end{pmatrix}$	$\mathbf{D - A}$
$\mathbf{m_5}$	$\begin{pmatrix} -1.5 \\ 4 \end{pmatrix}$	$\mathbf{E - B}$
$\mathbf{m_6}$	$\begin{pmatrix} 4.5 \\ -6.5 \end{pmatrix}$	$\mathbf{F - C}$
$\mathbf{n_4}$	$\begin{pmatrix} 2.5 \\ 3 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_4}$
$\mathbf{n_5}$	$\begin{pmatrix} 4 \\ 1.5 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_5}$
$\mathbf{n_6}$	$\begin{pmatrix} -6.5 \\ -4.5 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_6}$
G	$\begin{pmatrix} 0 \\ -1.33 \end{pmatrix}$	$\frac{\mathbf{A+B+C}}{3}$
$\|\mathbf{A - G}\|$	2.603	centroid divides median in ratio 2:1
$\|\mathbf{D - G}\|$	1.301	
$\|\mathbf{B - G}\|$	2.848	
$\|\mathbf{E - G}\|$	1.424	
$\|\mathbf{C - G}\|$	5.27	
$\|\mathbf{F - G}\|$	2.635	
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{D} & \mathbf{G} \end{pmatrix}$	2	$\therefore$ points are collinear
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{B} & \mathbf{E} & \mathbf{G} \end{pmatrix}$		
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{C} & \mathbf{F} & \mathbf{G} \end{pmatrix}$		
$\dfrac{AF}{ED}$	0.5, 0.5	AFDE is a quad

III. ALTITUDE

Parameters	Values	Description
$\mathbf{n_7}$	$\begin{pmatrix} -4 \\ 7 \end{pmatrix}$	alt AD_1
$\mathbf{n_8}$	$\begin{pmatrix} 5 \\ -6 \end{pmatrix}$	alt BE_1
$\mathbf{n_9}$	$\begin{pmatrix} -1 \\ -1 \end{pmatrix}$	alt CF_1
$\mathbf{H}$	$\begin{pmatrix} 2.636 \\ -2.636 \end{pmatrix}$	orthocentre

Parameters	Values	Description
$\mathbf{O}$	$\begin{pmatrix} -1.318 \\ -0.63 \end{pmatrix}$	circumcentre
$\|\mathbf{O} - \mathbf{A}\|$		
$\|\mathbf{O} - \mathbf{B}\|$	4.047	circumradius
$\|\mathbf{O} - \mathbf{C}\|$		

V. ANGLE BISECTOR

Parameters	Values	Description
I − A	$\begin{pmatrix} 1.347 \\ -0.061 \end{pmatrix}$	angle bisector of A
I − B	$\begin{pmatrix} 0.210 \\ 1.575 \end{pmatrix}$	angle bisector of B
I − C	$\begin{pmatrix} -1.136 \\ 1.636 \end{pmatrix}$	angle bisector of C
I	$\begin{pmatrix} 1.139 \\ -2.96 \end{pmatrix}$	incentre
R_i	0.636	incentre radius
$\angle BAI$ / $\angle CAI$	47.597°	bisector of A
$\angle ABI$ / $\angle CBI$	142.67°	bisector of B
$\angle BCI$ / $\angle ACI$	174.96°	bisector of C
D₃	$\begin{pmatrix} 0.586 \\ -3.2 \end{pmatrix}$	points of intersection
E₃	$\begin{pmatrix} 1.627 \\ -2.55 \end{pmatrix}$	
F₃	$\begin{pmatrix} -0.586 \\ -3.2 \end{pmatrix}$	