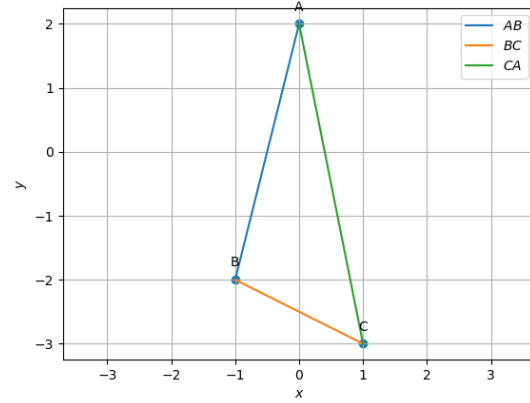# Random vectors

Chhatrapati-EE22BTECH11012

Random vectors are:
$$\mathbf{A} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}; \mathbf{B} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}; \mathbf{C} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$$
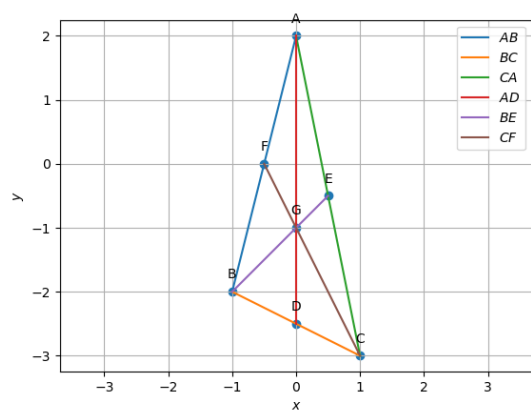
I. Vectors

Parameters	Values	Description
$\mathbf{m_1}$	$\begin{pmatrix} -1 \\ -4 \end{pmatrix}$	$\mathbf{B} - \mathbf{A}$
$\mathbf{m_2}$	$\begin{pmatrix} 2 \\ -1 \end{pmatrix}$	$\mathbf{C} - \mathbf{B}$
$\mathbf{m_3}$	$\begin{pmatrix} -1 \\ 5 \end{pmatrix}$	$\mathbf{A} - \mathbf{C}$
$\|\mathbf{B} - \mathbf{A}\|$	4.1231	length of AB
$\|\mathbf{C} - \mathbf{B}\|$	2.236	length of BC
$\|\mathbf{A} - \mathbf{C}\|$	5.099	length of CA
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	Non-collinear
$\mathbf{n_1}$	$\begin{pmatrix} -4 \\ 1 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_1}$
$\mathbf{n_2}$	$\begin{pmatrix} -1 \\ -2 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_2}$
$\mathbf{n_3}$	$\begin{pmatrix} 5 \\ 1 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\mathbf{m_3}$
$\frac{1}{2}\|m_1 \times m_2\|$	4.5	Area
$\angle A$	25.3461°	
$\angle B$	102.5288°	
$\angle C$	52.125°	

Parameters	Values	Description
D	$\begin{pmatrix} 0 \\ -2.5 \end{pmatrix}$	$\frac{\mathbf{A+B}}{2}$
E	$\begin{pmatrix} 0.5 \\ -0.5 \end{pmatrix}$	$\frac{\mathbf{C+A}}{2}$
F	$\begin{pmatrix} -0.5 \\ 0 \end{pmatrix}$	$\frac{\mathbf{B+C}}{2}$
$\mathbf{m_4}$	$\begin{pmatrix} 0 \\ -4.5 \end{pmatrix}$	$\mathbf{D - A}$
$\mathbf{m_5}$	$\begin{pmatrix} 1.5 \\ 1.5 \end{pmatrix}$	$\mathbf{E - B}$
$\mathbf{m_6}$	$\begin{pmatrix} -1.5 \\ 3 \end{pmatrix}$	$\mathbf{F - C}$
$\mathbf{n_4}$	$\begin{pmatrix} -4.5 \\ 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m_4}$
$\mathbf{n_5}$	$\begin{pmatrix} 1.5 \\ -1.5 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m_5}$
$\mathbf{n_6}$	$\begin{pmatrix} 3 \\ 1.5 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m_6}$
G	$\begin{pmatrix} 0 \\ -1 \end{pmatrix}$	$\frac{\mathbf{A+B+C}}{3}$
$\lVert \mathbf{A - G} \rVert$	3	
$\lVert \mathbf{D - G} \rVert$	1.5	
$\lVert \mathbf{B - G} \rVert$	1.4142	$\frac{AG}{DG} = \frac{BG}{EG} = \frac{CG}{FG} = \frac{2}{1}$
$\lVert \mathbf{E - G} \rVert$	0.7071	
$\lVert \mathbf{C - G} \rVert$	2.236	
$\lVert \mathbf{F - G} \rVert$	1.118	
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{D} & \mathbf{G} \end{pmatrix}$	2	Points are collinear
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{B} & \mathbf{E} & \mathbf{G} \end{pmatrix}$		
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{C} & \mathbf{F} & \mathbf{G} \end{pmatrix}$		
$\frac{AF}{ED}$	$\begin{pmatrix} 0.5 \\ 2 \end{pmatrix}$	AFDE is a parallelogram

III. ALTITUDE

Parameters	Values	Description
$\mathbf{p_1}$	$\begin{pmatrix} 2 \\ -1 \end{pmatrix}$	alt AD_1
$\mathbf{p_2}$	$\begin{pmatrix} -1 \\ 5 \end{pmatrix}$	alt BE_1
$\mathbf{p_3}$	$\begin{pmatrix} -1 \\ -4 \end{pmatrix}$	alt CF_1
$\mathbf{H}$	$\begin{pmatrix} -2.111 \\ -2.222 \end{pmatrix}$	orthocentre
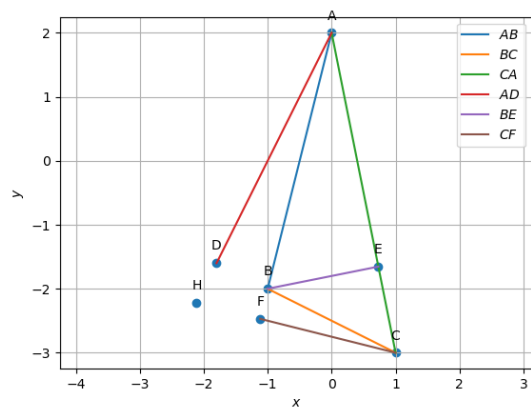
IV. Perpendicular Bisector

Parameters	Values	Description
O	$\begin{pmatrix} 1.055 \\ -0.388 \end{pmatrix}$	circumcentre
‖O − A‖		
‖O − B‖	2.6117	circumradius
‖O − C‖		
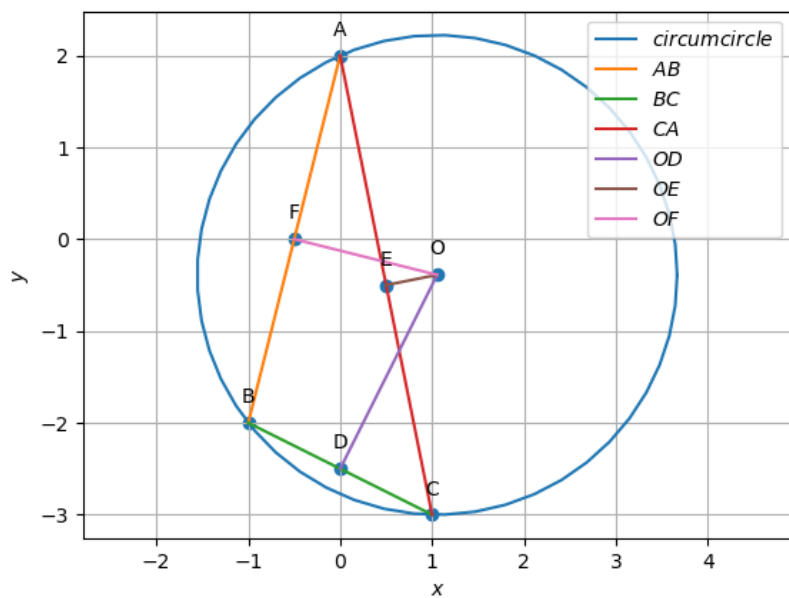
V. ANGLE BISECTOR

Parameters	Values	Description
I − A	$\begin{pmatrix} 0.046 \\ 1.950 \end{pmatrix}$	angle bisector of A
I − B	$\begin{pmatrix} 1.137 \\ 0.523 \end{pmatrix}$	angle bisector of B
I − C	$\begin{pmatrix} 1.09 \\ -1.427 \end{pmatrix}$	angle bisector of C
I	$\begin{pmatrix} -0.0851 \\ -1.579 \end{pmatrix}$	incentre
R_i	0.7854	incentre radius
$\angle BAI$	12.673°	bisector of A
$\angle CAI$		
$\angle ABI$	128.735°	bisector of B
$\angle CBI$		
$\angle BCI$	153.937°	bisector of C
$\angle ACI$		
D₃	$\begin{pmatrix} -0.4364 \\ -2.2817 \end{pmatrix}$	points of intersection
E₃	$\begin{pmatrix} 0.685 \\ -1.4251 \end{pmatrix}$	
F₃	$\begin{pmatrix} -0.8471 \\ -2.2817 \end{pmatrix}$	