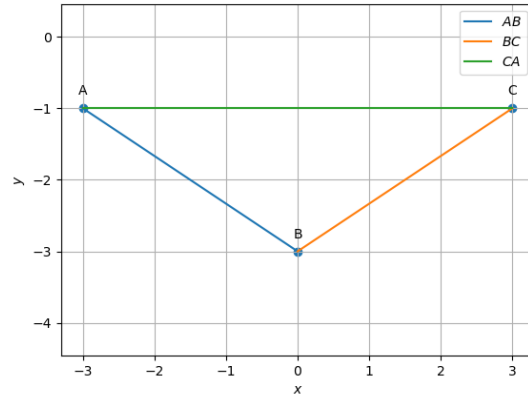


# Probability and Random Processes

A.Rakesh Kumar EE22BTECH11005\*

$$\mathbf{A} = \begin{pmatrix} -3 \\ -1 \end{pmatrix}; \mathbf{B} = \begin{pmatrix} 0 \\ -3 \end{pmatrix}; \mathbf{C} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$$

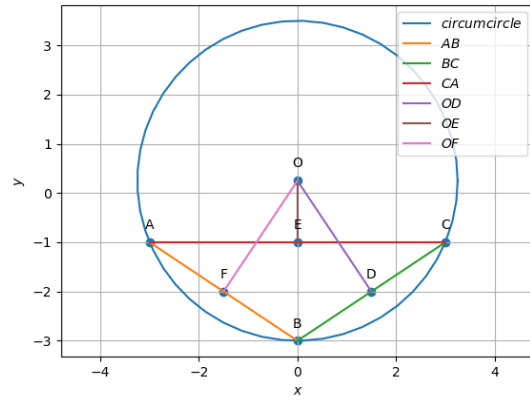
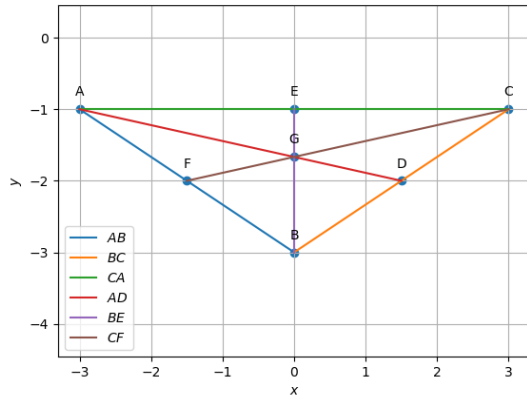


## I. VERTICES

Parameters	Values	Description
$\mathbf{m}_1$	$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$	$\mathbf{B} - \mathbf{A}$
$\mathbf{m}_2$	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	$\mathbf{C} - \mathbf{B}$
$\mathbf{m}_3$	$\begin{pmatrix} -6 \\ 0 \end{pmatrix}$	$\mathbf{A} - \mathbf{C}$
$\ \mathbf{B} - \mathbf{A}\ $	$\sqrt{13}$	length of $AB$
$\ \mathbf{C} - \mathbf{B}\ $	$\sqrt{13}$	length of $BC$
$\ \mathbf{A} - \mathbf{C}\ $	6	length of $CA$
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	Non-collinear
$\mathbf{n}_1$	$\begin{pmatrix} -2 \\ -3 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m}_1$
$\mathbf{n}_2$	$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m}_2$
$\mathbf{n}_3$	$\begin{pmatrix} 0 \\ 6 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m}_3$
$\frac{1}{2} \ \mathbf{m}_1 \times \mathbf{m}_2\ $	6	Area
$\angle A$	$33.690^\circ$	Angle A
$\angle B$	$112.620^\circ$	Angle B
$\angle C$	$33.690^\circ$	Angle C

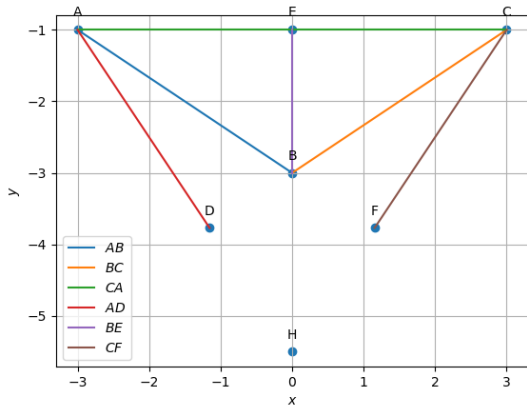
## II. CENTROID

Parameters	Values	Description
<b>D</b>	$\begin{pmatrix} \frac{3}{2} \\ -2 \end{pmatrix}$	$\frac{\mathbf{A}+\mathbf{B}}{2}$
<b>E</b>	$\begin{pmatrix} 0 \\ -1 \end{pmatrix}$	$\frac{\mathbf{C}+\mathbf{A}}{2}$
<b>F</b>	$\begin{pmatrix} -\frac{3}{2} \\ -2 \end{pmatrix}$	$\frac{\mathbf{B}+\mathbf{C}}{2}$
<b>m<sub>4</sub></b>	$\begin{pmatrix} \frac{9}{2} \\ -1 \end{pmatrix}$	<b>D – A</b>
<b>m<sub>5</sub></b>	$\begin{pmatrix} 0 \\ 2 \end{pmatrix}$	<b>E – B</b>
<b>m<sub>6</sub></b>	$\begin{pmatrix} -\frac{9}{2} \\ -1 \end{pmatrix}$	<b>F – C</b>
<b>n<sub>4</sub></b>	$\begin{pmatrix} -1 \\ -\frac{9}{2} \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m}_4$
<b>n<sub>5</sub></b>	$\begin{pmatrix} 2 \\ 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m}_5$
<b>n<sub>6</sub></b>	$\begin{pmatrix} -1 \\ \frac{9}{2} \end{pmatrix}$	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m}_6$
<b>G</b>	$\begin{pmatrix} 0 \\ -\frac{4}{3} \end{pmatrix}$	$\frac{\mathbf{A}+\mathbf{B}+\mathbf{C}}{3}$
$\ \mathbf{A} - \mathbf{G}\ $	3.073	$\therefore \frac{AG}{GD} = \frac{BG}{GE} = \frac{CG}{GF} = 2$
$\ \mathbf{D} - \mathbf{G}\ $	1.536	
$\ \mathbf{B} - \mathbf{G}\ $	1.333	
$\ \mathbf{E} - \mathbf{G}\ $	0.667	
$\ \mathbf{C} - \mathbf{G}\ $	3.073	
$\ \mathbf{F} - \mathbf{G}\ $	1.536	
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{D} & \mathbf{G} \end{pmatrix}$	2	The points are collinear
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ \mathbf{B} & \mathbf{E} & \mathbf{G} \end{pmatrix}$		
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ \mathbf{C} & \mathbf{F} & \mathbf{G} \end{pmatrix}$		
AF	$\begin{pmatrix} -\frac{3}{2} \\ 1 \end{pmatrix}$	AFDE is a quadrilateral
ED		



### III. ORTHOCENTRE

Parameters	Values	Description
$\mathbf{n}_7$	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	alt $AD_1$
$\mathbf{n}_8$	$\begin{pmatrix} -6 \\ 0 \end{pmatrix}$	alt $BE_1$
$\mathbf{n}_9$	$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$	alt $CF_1$
$\mathbf{H}$	$\begin{pmatrix} 0 \\ -\frac{11}{2} \end{pmatrix}$	orthocentre



### IV. CIRCUMCENTRE

Parameters	Values	Description
$\mathbf{O}$	$\left(0, \frac{1}{4}\right)$	circumcentre
$\ \mathbf{O} - \mathbf{A}\ $	3.250	circumradius
$\ \mathbf{O} - \mathbf{B}\ $		
$\ \mathbf{O} - \mathbf{C}\ $		

### V. INCENTRE

Parameters	Values	Description
$\mathbf{I} - \mathbf{A}$	$\begin{pmatrix} -1.832 \\ 0.555 \end{pmatrix}$	angle bisector of $A$
$\mathbf{I} - \mathbf{B}$	$\begin{pmatrix} 0 \\ 1.109 \end{pmatrix}$	angle bisector of $B$
$\mathbf{I} - \mathbf{C}$	$\begin{pmatrix} 1.832 \\ 0.555 \end{pmatrix}$	angle bisector of $C$
$\mathbf{I}$	$\begin{pmatrix} 0 \\ -1.908 \end{pmatrix}$	incentre
$r$	0.908	incentre radius
$\angle BAI$	$16.845^\circ$	bisector of $A$
$\angle CAI$		
$\angle ABI$	$56.310^\circ$	bisector of $B$
$\angle CBI$		
$\angle BCI$	$16.845^\circ$	bisector of $C$
$\angle ACI$		
$\mathbf{D}_3$	$\begin{pmatrix} 0.504 \\ -2.664 \end{pmatrix}$	points of intersection
$\mathbf{E}_3$	$\begin{pmatrix} 0 \\ -1 \end{pmatrix}$	
$\mathbf{F}_3$	$\begin{pmatrix} -0.504 \\ -2.664 \end{pmatrix}$	

