Random Vectors Assignment

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Consider the vertices,

$$\mathbf{A} = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 1 \\ 3 \end{pmatrix} \qquad \mathbf{C} = \begin{pmatrix} -3 \\ -1 \end{pmatrix} \tag{1}$$

I. VECTORS

parameter	**value**	**description**
$\mathbf{m_1}$	$\begin{pmatrix} -1 \\ 8 \end{pmatrix}$	Direction vector of AB: $(\mathbf{B}-\mathbf{A})$
$\mathbf{m_2}$	$\begin{pmatrix} -4 \\ -4 \end{pmatrix}$	Direction Vector of BC: $(\mathbf{C}-\mathbf{B})$
$\mathbf{m_3}$	$\begin{pmatrix} 5 \\ -4 \end{pmatrix}$	Direction vector of CA: $(\mathbf{A}-\mathbf{C})$
$\|\mathbf{B}-\mathbf{A}\|$	8.06	Length of AB
$\|\mathbf{C}-\mathbf{B}\|$	5.66	Length of BC
$\|\mathbf{A}-\mathbf{C}\|$	6.40	Length of AC
rank $\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	Points are not collinear
$\mathbf{n_1}^\top$	$\begin{pmatrix} 8 & 1 \end{pmatrix}$	Normal Vector of line AB
c_1	11	Constant of line AB
$\mathbf{n_2}^\top$	$\begin{pmatrix} -4 & 4 \end{pmatrix}$	Normal Vector of line BC
c_2	8	Constant of line BC
$\mathbf{n_3}^\top$	$\begin{pmatrix} -4 & -5 \end{pmatrix}$	Normal Vector of line CA
c_3	17	Constant of line CA
area	18	Area of triangle
$\angle A$	44.22°	Angles of Triangle
$\angle B$	52.13°	
$\angle C$	83.66°	

TABLE I.1
VECTORS

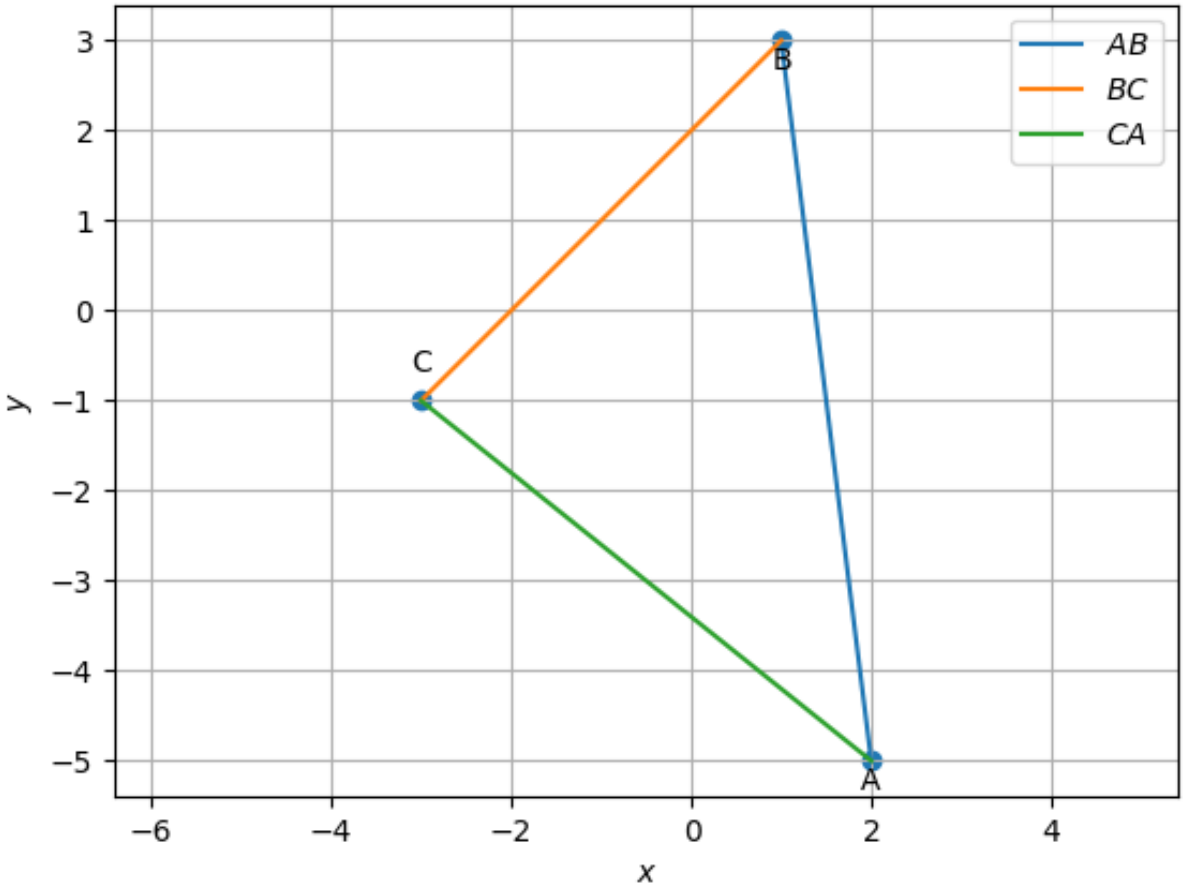

Fig. I.1. Triangle ABC

II. MEDIANS

parameter	value	description
D	$\begin{pmatrix} -1 \\ 1 \end{pmatrix}$	midpoint of line BC
E	$\begin{pmatrix} -0.5 \\ -3 \end{pmatrix}$	midpoint of line AC
F	$\begin{pmatrix} 1.5 \\ -1 \end{pmatrix}$	midpoint of line AB
$\mathbf{n_4}^\top$	$\begin{pmatrix} 6 & 3 \end{pmatrix}$	Normal Vector of line AD
c_4	-3	Coefficient of line AD
$\mathbf{n_5}^\top$	$\begin{pmatrix} -6 & 1.5 \end{pmatrix}$	Normal Vector of line BE
c_5	-1.5	Coefficient of line BE
$\mathbf{n_6}^\top$	$\begin{pmatrix} 0 & -4.5 \end{pmatrix}$	Normal Vector of line CF
c_6	4.5	Coefficient of line CF
G	$\begin{pmatrix} 1.39 \\ -1 \end{pmatrix}$	Centroid of triangle

TABLE II.2
MEDIANS

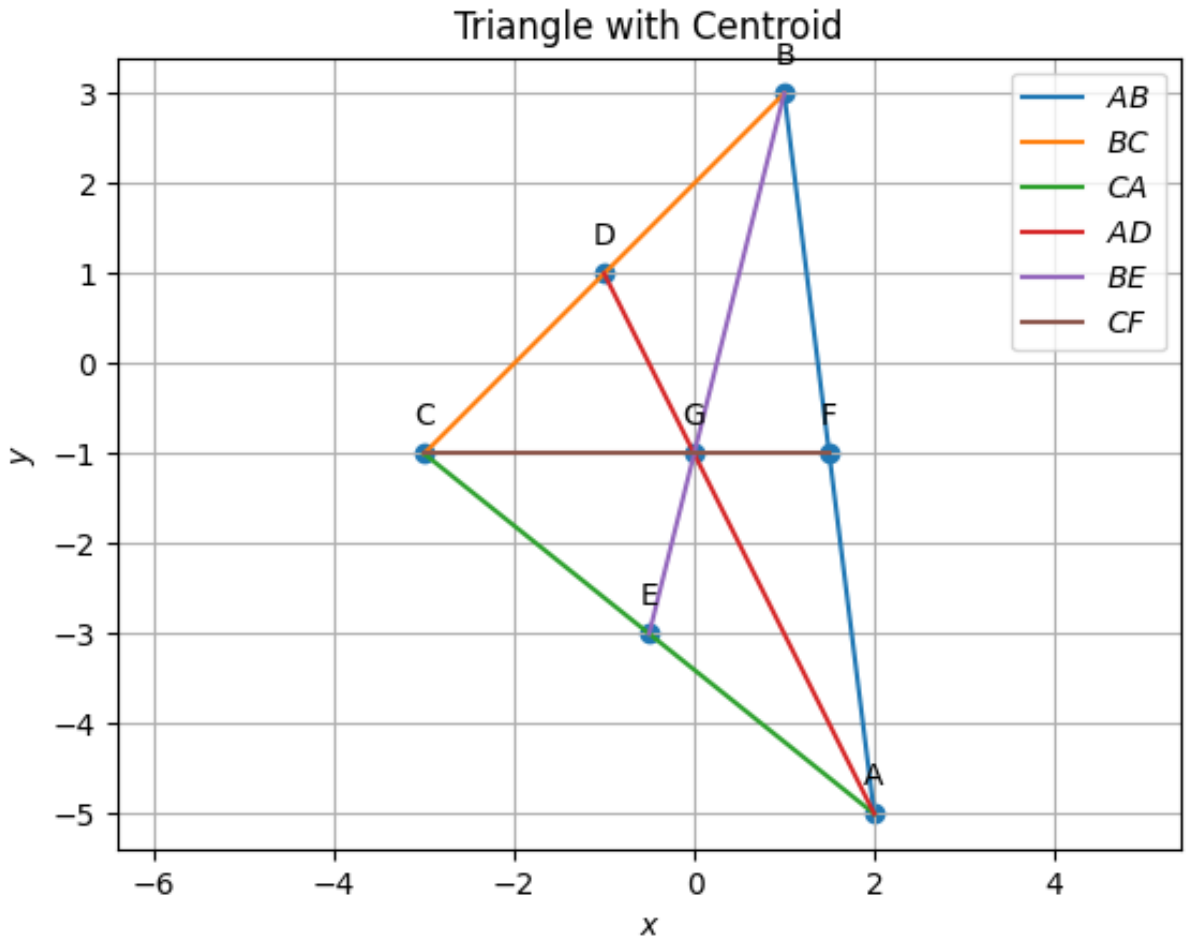

Fig. II.2. Triangle ABC with medians AD, BE and CF

III. ALTITUDES

parameter	value	description
$\mathbf{n_7^\top}$	$\begin{pmatrix}-4 & -4\end{pmatrix}$	Normal Vector of altitude AD_1
c_7	12	Coefficient of altitude AD_1
$\mathbf{n_8^\top}$	$\begin{pmatrix}5 & -4\end{pmatrix}$	Normal Vector of altitude BE_1
c_8	-7	Coefficient of altitude BE_1
$\mathbf{n_9^\top}$	$\begin{pmatrix}-1 & 8\end{pmatrix}$	Normal Vector of altitude CF_1
c_9	-5	Coefficient of altitude CF_1
H	$\begin{pmatrix}-2.11\\-0.89\end{pmatrix}$	Orthocentre of triangle

TABLE III.3
ALTITUDES

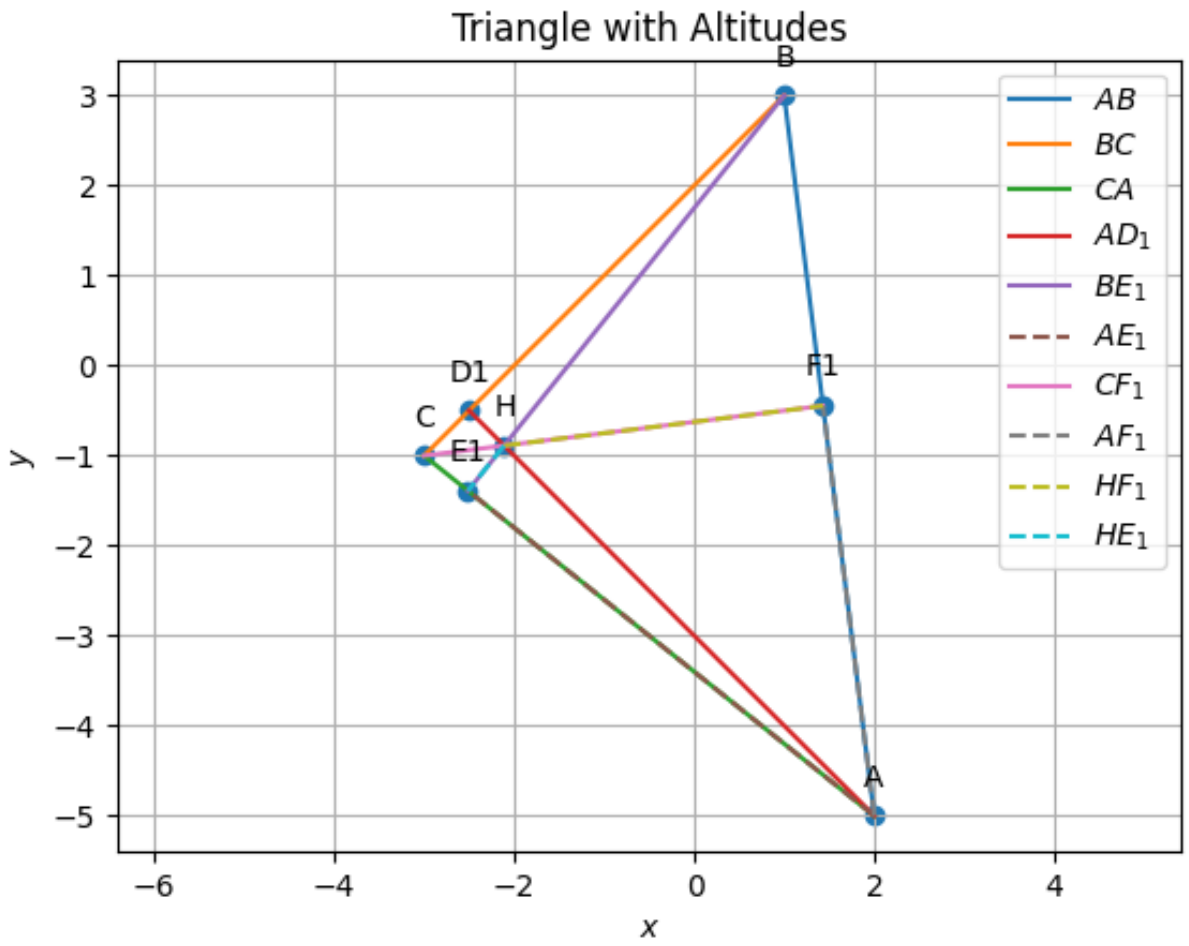

Fig. III.3. Triangle ABC with altitudes AD_1, BE_1 and CF_1

IV. PERPENDICULAR BISECTOR

parameter	value	description
$\mathbf{n}_{10}^{\top}$	$\begin{pmatrix}1 & -8\end{pmatrix}$	Normal Vector of perpendicular bisector of AB
c_{10}	9.5	Coefficient of perpendicular bisector of AB
$\mathbf{n}_{11}^{\top}$	$\begin{pmatrix}4 & 4\end{pmatrix}$	Normal Vector of perpendicular bisector of BC
c_{11}	0	Coefficient of perpendicular bisector of BC
$\mathbf{n}_{12}^{\top}$	$\begin{pmatrix}-5 & -4\end{pmatrix}$	Normal Vector of perpendicular bisector of CA
c_{12}	-9.5	Coefficient of perpendicular bisector of CA
O	$\begin{pmatrix}1.06\\-1.06\end{pmatrix}$	Circumcentre
Radius	4.06	Circumradius

TABLE IV.4
PERPENDICULAR BISECTOR

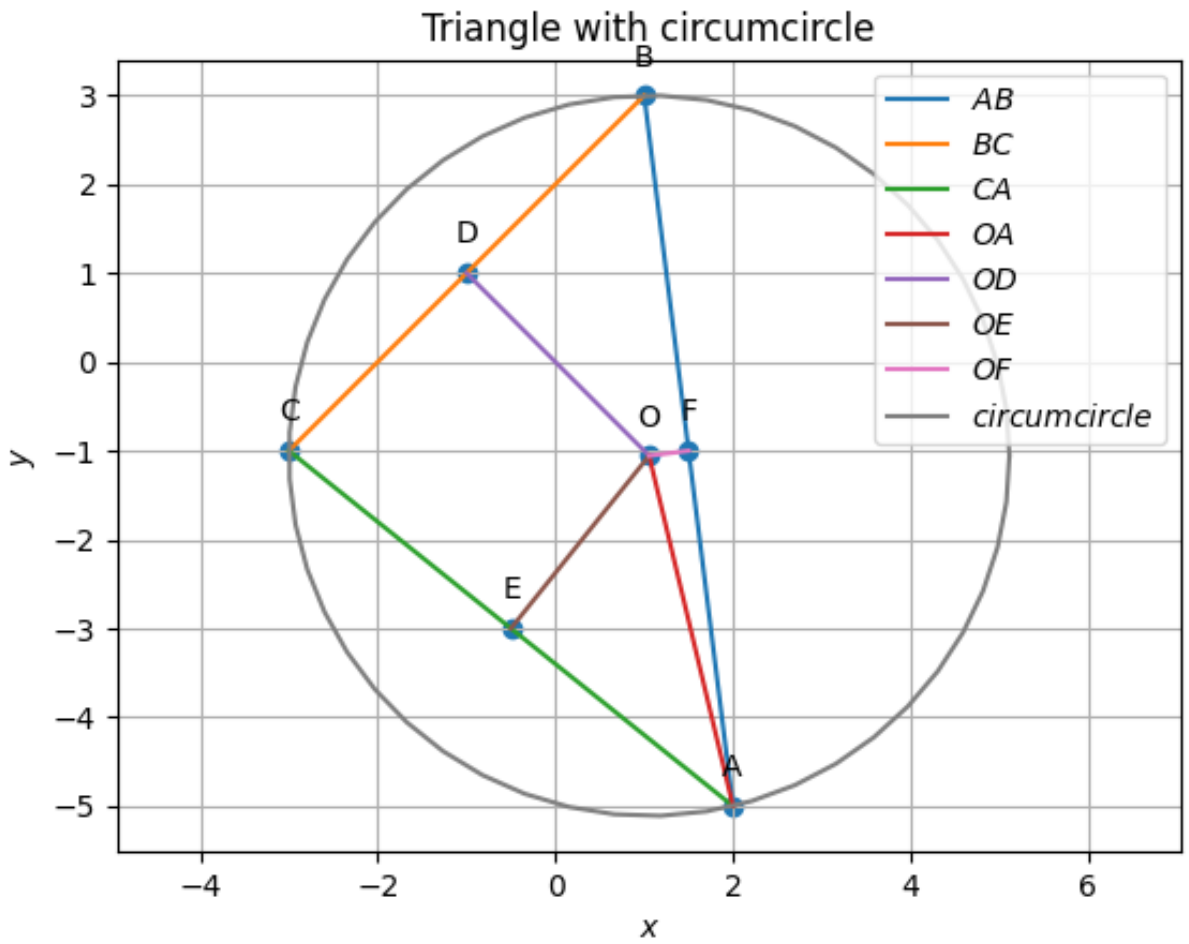

Fig. IV.4. circumcircle of triangle ABC with circumcentre O

V. ANGULAR BISECTOR

parameter	value	description
$\mathbf{n_{13}^\top}$	$\begin{pmatrix}1.62 & 0.9\end{pmatrix}$	Normal Vector of Angular bisector of A
c_{13}	-1.29	Coefficient of Angular bisector of A
$\mathbf{n_{14}^\top}$	$\begin{pmatrix}-1.7 & 0.58\end{pmatrix}$	Normal Vector of Angular bisector of B
c_{14}	0.05	Coefficient of Angular bisector of B
$\mathbf{n_{15}^\top}$	$\begin{pmatrix}0.08 & -1.49\end{pmatrix}$	Normal Vector of Angular bisector of C
c_{15}	1.24	Coefficient of Angular bisector of B
$\mathbf{I}$	$\begin{pmatrix}-0.32\\-0.85\end{pmatrix}$	Incentre
radius	1.79	Inradius
$\mathbf{D}_3$	$\begin{pmatrix}-1.59\\0.41\end{pmatrix}$	Point of Contact on BC
$\mathbf{E}_3$	$\begin{pmatrix}1.45\\-0.63\end{pmatrix}$	Point of Contact on AB
$\mathbf{F}_3$	$\begin{pmatrix}-1.44\\-2.25\end{pmatrix}$	Point of Contact on CA

TABLE V.5
ANGULAR BISECTOR

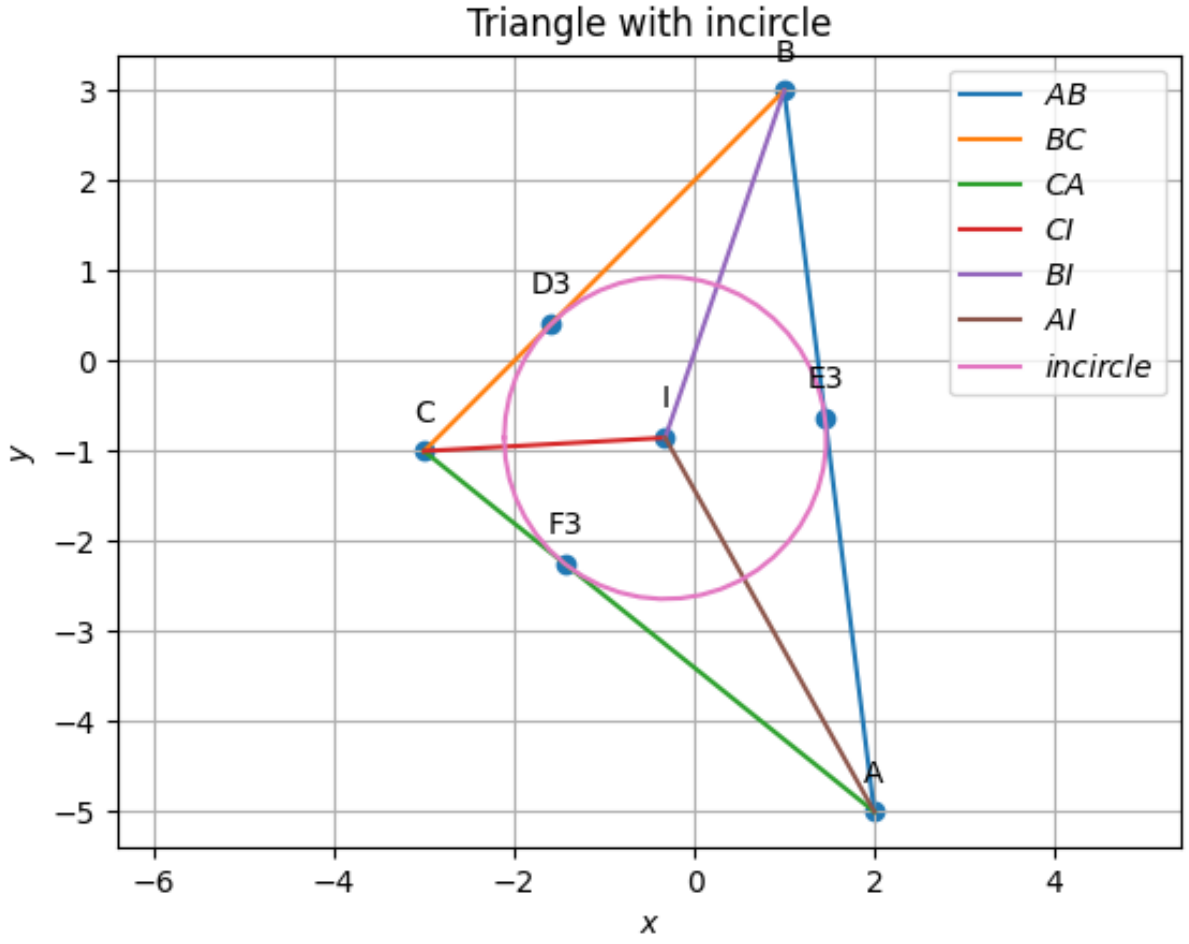

Fig. V.5. incircle of triangle ABC with incentre I