

Random Vector Assignment

EE22BTECH11039 - Pandrangi Aditya Sriram

Consider a triangle with vertices:

$$\mathbf{A} = \begin{pmatrix} 1 \\ 5 \end{pmatrix} \quad (1)$$

$$\mathbf{B} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2)$$

$$\mathbf{C} = \begin{pmatrix} -2 \\ 4 \end{pmatrix} \quad (3)$$

I. VECTOR

Parameters	Value	Description
\mathbf{m}_{AB}	$\begin{pmatrix} 0 \\ -5 \end{pmatrix}$	Direction vector of AB
\mathbf{m}_{BC}	$\begin{pmatrix} -3 \\ 4 \end{pmatrix}$	Direction vector of BC
\mathbf{m}_{CA}	$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$	Direction vector of CA
$\ \mathbf{A} - \mathbf{B}\ $	5.00	Length of AB
$\ \mathbf{B} - \mathbf{C}\ $	5.00	Length of BC
$\ \mathbf{C} - \mathbf{A}\ $	3.16	Length of CA
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	Non-collinear
\mathbf{n}_{AB}^\top	$\begin{pmatrix} -5 & 0 \end{pmatrix}$	AB
c_1	-5	
\mathbf{n}_{BC}^\top	$\begin{pmatrix} 4 & 3 \end{pmatrix}$	BC
c_2	4	
\mathbf{n}_{CA}^\top	$\begin{pmatrix} 1 & -3 \end{pmatrix}$	AC
c_3	-14	
Area	7.5	Area of $\triangle ABC$
Angle	71.57°	$\angle A$
Angle	36.87°	$\angle B$
Angle	71.57°	$\angle C$

TABLE 0
BASIC PROPERTIES OF A TRIANGLE

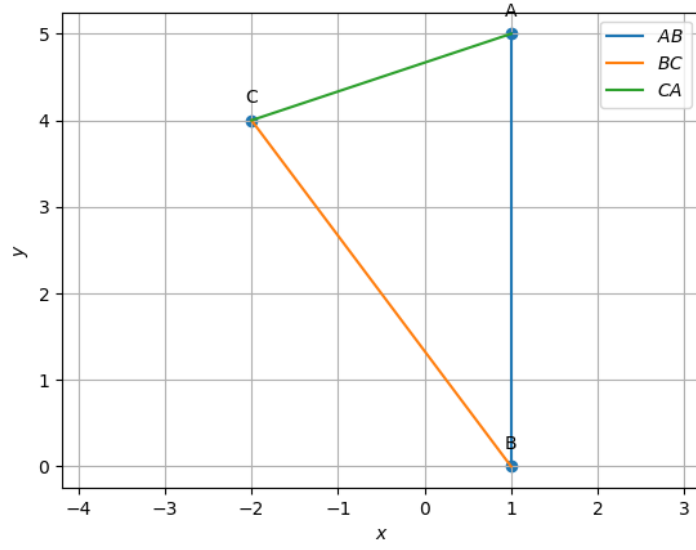


Fig. 0. Triangle on a plot

II. MEDIAN

Parameters	Value	Description
D	$\begin{pmatrix} -0.5 \\ 2 \end{pmatrix}$	Midpoint AB
E	$\begin{pmatrix} -0.5 \\ 4.5 \end{pmatrix}$	Midpoint BC
F	$\begin{pmatrix} 1 \\ 2.5 \end{pmatrix}$	Midpoint CA
\mathbf{n}_{AD}^T	$\begin{pmatrix} -3 & 1.5 \end{pmatrix}$	AD
c_1	4.5	
\mathbf{n}_{BE}^T	$\begin{pmatrix} 4.5 & 1.5 \end{pmatrix}$	BE
c_2	4.5	
\mathbf{n}_{CF}^T	$\begin{pmatrix} -1.5 & -3 \end{pmatrix}$	CF
c_3	-9	
G	$\begin{pmatrix} 0 \\ 3 \end{pmatrix}$	Centroid

TABLE 0
MEDIAN

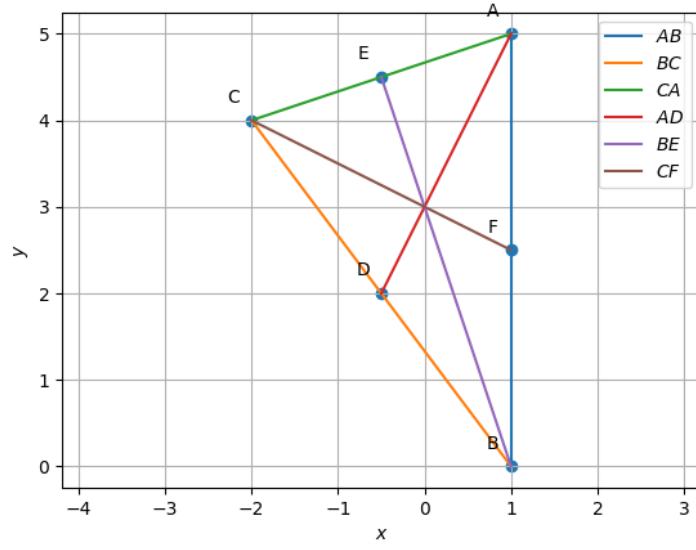


Fig. 0. Medians on a plot

III. ALTITUDE

Parameters	Value	Description
$\mathbf{n}_{AD_1}^\top$	$\begin{pmatrix} -3 & 4 \end{pmatrix}$	AD_1
c_1	17	
$\mathbf{n}_{BE_1}^\top$	$\begin{pmatrix} 3 & 1 \end{pmatrix}$	BE_1
c_2	3	
$\mathbf{n}_{CF_1}^\top$	$\begin{pmatrix} 0 & -5 \end{pmatrix}$	CF_1
c_3	-20	
\mathbf{H}	$\begin{pmatrix} -0.33 \\ 4 \end{pmatrix}$	Orthocenter

TABLE 0
ALTITUDE

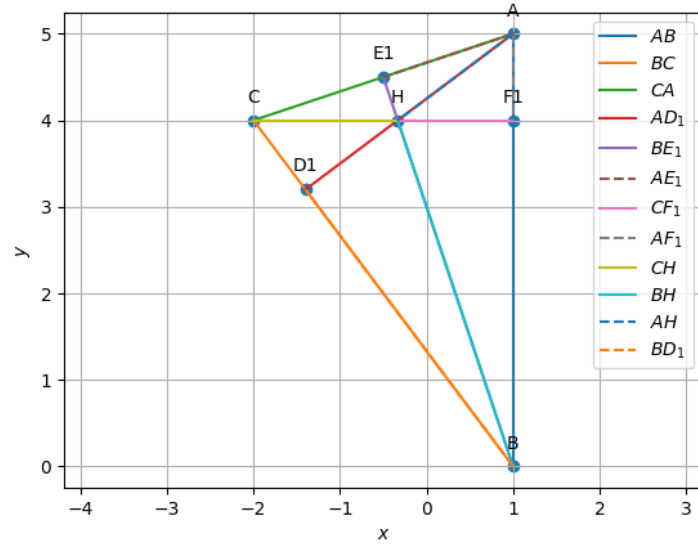


Fig. 0. Altitudes on a plot

IV. PERPENDICULAR BISECTOR

Parameters	Value	Description
\mathbf{n}^T	$(0 \ 5)$	Perpendicular bisector of AB
c_1	12.5	
\mathbf{n}^T	$(3 \ -4)$	Perpendicular bisector of BC
c_2	-9.5	
\mathbf{n}^T	$(-3 \ -1)$	Perpendicular bisector of CA
c	-3	
Center(\mathbf{O})	$\begin{pmatrix} 0.16 \\ 2.5 \end{pmatrix}$	Circumcircle
Circumradius	2.64	

TABLE 0
PERPENDICULAR BISECTORS

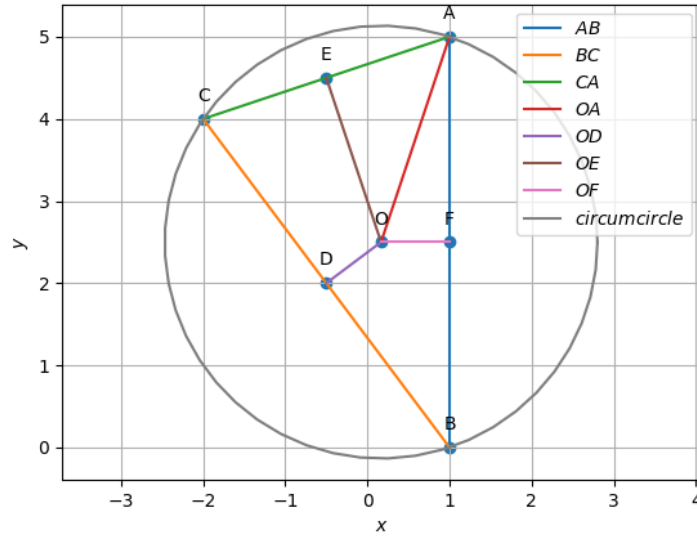


Fig. 0. Perpendicular Bisectors on a plot

V. ANGULAR BISECTOR

Parameters	Value	Description
\mathbf{n}^T	$(-1.32 \ 0.95)$	Angular bisector of A
c_2	3.43	
\mathbf{n}^T	$(1.8 \ 0.6)$	Angular bisector of B
c_2	1.8	
\mathbf{n}^T	$(-0.48 \ -1.55)$	Angular bisector of C
c_2	-8.23	
Incenter(I)	$\begin{pmatrix} -0.14 \\ 3.42 \end{pmatrix}$	Incircle
Inradius	1.14	
$\angle BAI$	35.78°	Angle
$\angle CAI$	35.78°	Angle
\mathbf{D}_3	$\begin{pmatrix} -1.05 \\ 2.74 \end{pmatrix}$	POC with AB
\mathbf{E}_3	$\begin{pmatrix} 1 \\ 3.42 \end{pmatrix}$	POC with BC
\mathbf{F}_3	$\begin{pmatrix} -0.5 \\ 4.5 \end{pmatrix}$	POC with CA
Length	1.58	AF_3, CE_3
Length	3.42	BD_3, BE_3
Length	1.58	CF_3, CD_3

TABLE 0
ANGULAR BISECTORS

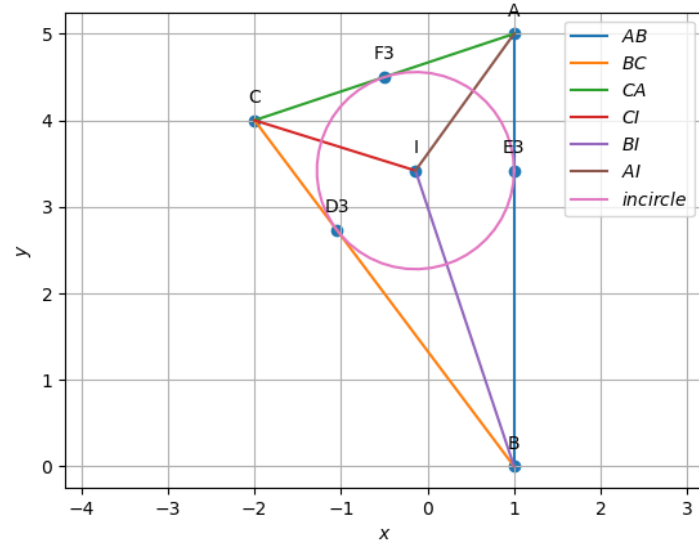


Fig. 0. Angle Bisectors on a plot