

Sample L^AT_EX Document with a Figure

G V V Sharma*

Consider a triangle with vertices,

$$\mathbf{A} = \begin{pmatrix} 3 \\ -4 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} -4 \\ 1 \end{pmatrix} \quad \mathbf{C} = \begin{pmatrix} 1 \\ 4 \end{pmatrix} \quad (1)$$

I. VECTORS

Parameter	Value	Description
\mathbf{m}_{AB}	$\begin{pmatrix} -7 \\ 5 \end{pmatrix}$	Direction vec of AB
\mathbf{m}_{BC}	$\begin{pmatrix} 5 \\ 3 \end{pmatrix}$	Direction vec of BC
\mathbf{m}_{CA}	$\begin{pmatrix} 2 \\ -8 \end{pmatrix}$	Direction vec of CA
$\ \mathbf{A} - \mathbf{B}\ $	5.831	Length of AB
$\ \mathbf{B} - \mathbf{C}\ $		Length of BC
$\ \mathbf{C} - \mathbf{A}\ $		Length of CA
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ A & B & C \end{pmatrix}$	3	non-collinear
\mathbf{n}_{AB}	$\begin{pmatrix} 5 \\ 7 \end{pmatrix}$	Normal vec of AB
\mathbf{c}_{AB}	-13	Constant in AB
\mathbf{n}_{BC}	$\begin{pmatrix} 3 \\ -5 \end{pmatrix}$	Normal vec of BC
\mathbf{c}_{BC}	-17	Constant in BC
\mathbf{n}_{CA}	$\begin{pmatrix} -8 \\ -2 \end{pmatrix}$	Normal vec of CA
\mathbf{c}_{CA}	-16	Constant in CA
Area	23	Area of $\triangle ABC$
$\cos(\mathbf{A})$	0.761	cosine of $\angle \mathbf{A}$
$\cos(\mathbf{B})$	0.398	cosine of $\angle \mathbf{B}$
$\cos(\mathbf{C})$	0.291	cosine of $\angle \mathbf{C}$

TABLE I.1
VECTORS

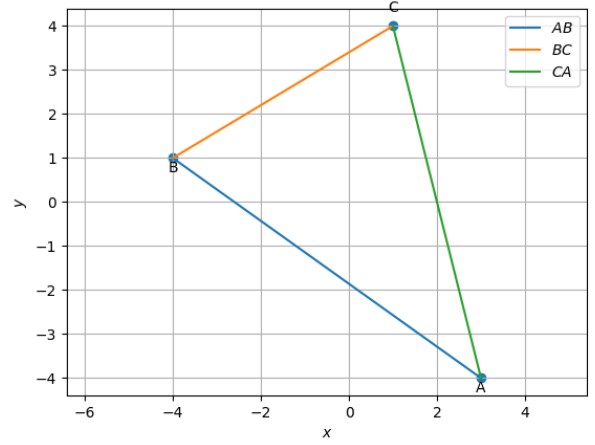


Fig. I.1. Triangle generated using python

II. MEDIAN

Parameter	Value	Description
D	$\begin{pmatrix} -1.5 \\ 2.5 \end{pmatrix}$	Midpoint AB
E	$\begin{pmatrix} 2 \\ 0 \end{pmatrix}$	Midpoint BC
F	$\begin{pmatrix} 0.5 \\ -1.5 \end{pmatrix}$	Midpoint CA
\mathbf{n}_{AD}	$\begin{pmatrix} 6.5 \\ 4.5 \end{pmatrix}$	Normal vec of AD
\mathbf{c}_{AD}	1.5	Constant of AD
\mathbf{n}_{BE}	$\begin{pmatrix} -1 \\ -6 \end{pmatrix}$	Normal vec of BE
\mathbf{c}_{BE}	-2	Constant of BE
\mathbf{n}_{CF}	$\begin{pmatrix} -5.5 \\ 1.5 \end{pmatrix}$	Normal vec of CF
\mathbf{c}_{CF}	0.5	Constant of CF
G	$\begin{pmatrix} -0 \\ 0.333 \end{pmatrix}$	Centroid
$\frac{BG}{GE}$	2	Ratio of BG and GE
$\frac{CG}{GF}$		Ratio of CG and GF
$\frac{AG}{GD}$		Ratio of AG and GD
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ A & D & G \end{pmatrix}$	2	A, D, G collinear
A – F	$\begin{pmatrix} 3.5 \\ -2.5 \end{pmatrix}$	Direction vec of AF
E – D		Direction vec of ED

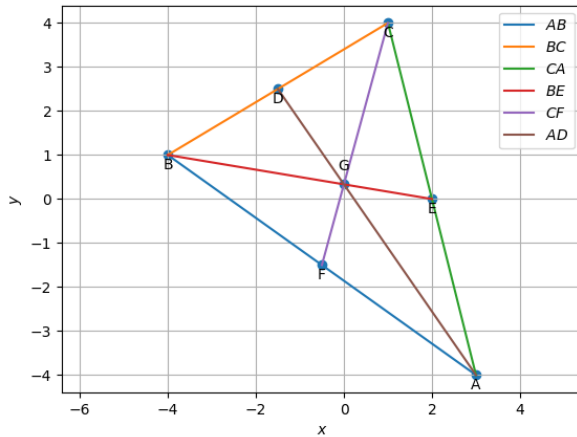


Fig. II.2. Medians generated using python

III. ALTITUDE

Parameter	Value	Description
D₁	$\begin{pmatrix} -1.059 \\ 2.764 \end{pmatrix}$	altitude foot from A
E₁	$\begin{pmatrix} 1.412 \\ 2.353 \end{pmatrix}$	altitude foot from B
F₁	$\begin{pmatrix} -2.108 \\ -0.351 \end{pmatrix}$	altitude foot from C
\mathbf{n}_{AD_1}	$\begin{pmatrix} 5 \\ 3 \end{pmatrix}$	Normal vec of AD_1
\mathbf{c}_{AD_1}	3	Constant of AD_1
\mathbf{n}_{BE_1}	$\begin{pmatrix} 2 \\ -8 \end{pmatrix}$	Normal vec of BE_1
\mathbf{c}_{BE_1}	-16	Constant of BE_1
\mathbf{n}_{CF_1}	$\begin{pmatrix} -7 \\ 5 \end{pmatrix}$	Normal vec of CF_1
\mathbf{c}_{CF_1}	13	Constant of CF_1
H	$\begin{pmatrix} -0.522 \\ 1.870 \end{pmatrix}$	Orthocenter

TABLE III.3
ORTHOCENTER

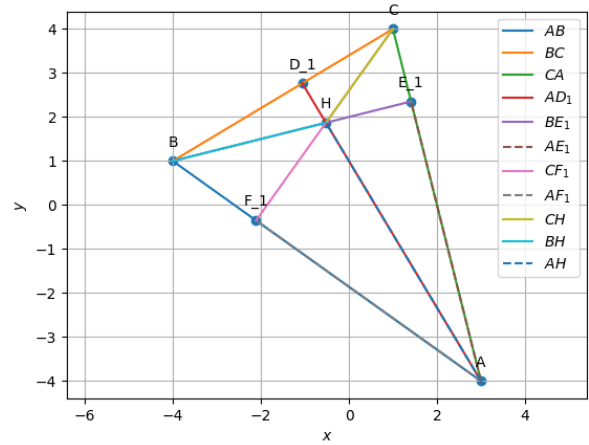


Fig. III.3. Altitudes generated using python

IV. PERPENDICULAR BISECTOR

Parameter	Value	Description
\mathbf{n}_{OA}	$\begin{pmatrix} -3.56 \\ -2.74 \end{pmatrix}$	Direction vec of OA
\mathbf{n}_{OB}	$\begin{pmatrix} 1.43 \\ 4.26 \end{pmatrix}$	Direction vec of OB
\mathbf{n}_{OC}	$\begin{pmatrix} 4.43 \\ -0.74 \end{pmatrix}$	Direction vec of OC
\mathbf{O}	$\begin{pmatrix} 0.261 \\ -0.435 \end{pmatrix}$	Circumcenter
\mathbf{n}_{OD}	$\begin{pmatrix} 7 \\ -5 \end{pmatrix}$	Normal vec of OD
\mathbf{c}_{OD}	4	Constant of OD
\mathbf{n}_{OE}	$\begin{pmatrix} -5 \\ -3 \end{pmatrix}$	Normal vec of OE
\mathbf{c}_{OE}	0	Constant of OE
\mathbf{n}_{OF}	$\begin{pmatrix} -2 \\ 8 \end{pmatrix}$	Normal vec of OF
\mathbf{c}_{OF}	-4	Constant of OF
$\ A - O\ $	4.496	Norm of OA
$\ B - O\ $		Norm of OB
$\ C - O\ $		Norm of OC
\mathbf{R}		Circumradius
$\angle BAC$	40.42°	Angle $\angle BAC$
$\angle BOC$	80.85°	Angle $\angle BOC$

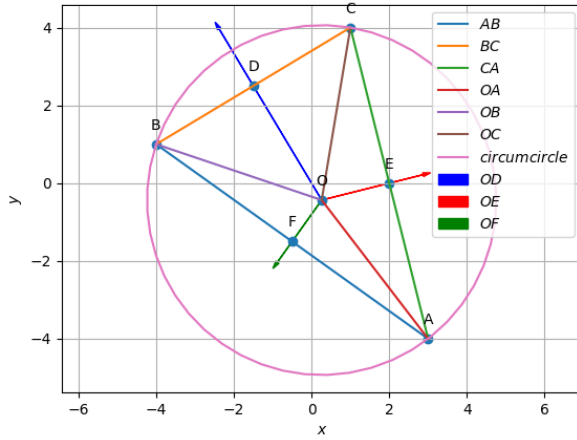
TABLE IV.4
CIRCUMCENTER

Fig. IV.4. Perpendicular bisectors generated using python

V. ANGULAR BISECTOR

Parameter	Value	Description
\mathbf{n}_{IA}	$\begin{pmatrix} 1.551 \\ 1.056 \end{pmatrix}$	Normal vec of IA
\mathbf{c}_{IA}	0.429	Constant vec of IA
\mathbf{n}_{IB}	$\begin{pmatrix} 0.066 \\ 1.671 \end{pmatrix}$	Normal vec of IB
\mathbf{c}_{IB}	1.404	Constant vec of IB
\mathbf{n}_{IC}	$\begin{pmatrix} 1.484 \\ -0.615 \end{pmatrix}$	Normal vec of IC
\mathbf{c}_{IC}	-0.975	Constant vec of IC
\mathbf{I}	$\begin{pmatrix} -0.30 \\ 0.85 \end{pmatrix}$	Incenter
\mathbf{D}_3	$\begin{pmatrix} -1.35 \\ 2.59 \end{pmatrix}$	POC with AB
\mathbf{E}_3	$\begin{pmatrix} 1.66 \\ 1.34 \end{pmatrix}$	POC with BC
\mathbf{F}_3	$\begin{pmatrix} -1.48 \\ -0.80 \end{pmatrix}$	POC with CA
$\ \mathbf{D}_3 - \mathbf{O}\ $	2.03	Norm of OD_3
$\ \mathbf{E}_3 - \mathbf{O}\ $		Norm of OE_3
$\ \mathbf{F}_3 - \mathbf{O}\ $		Norm of OF_3
\mathbf{r}		Inradius
$\angle BAI$	20.21°	Angle $\angle BAI$
$\angle CAI$		Angle $\angle CAI$

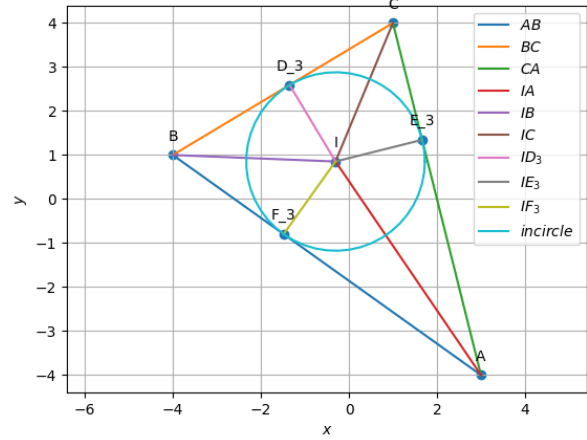
TABLE V.5
INCIRCLE

Fig. V.5. Incircle generated using python