INTRO TO AI AND ML

(EE1390)

MATRIX PROJECT

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PROBLEM:31

A variable line drawn through the intersection of lines
$\begin{bmatrix}4 & 3\end{bmatrix}$X=12
$\begin{bmatrix}3 & 4\end{bmatrix}$X = 12
meets the cordinate axes at A and B,then find the locus of the mid point.

Solution

The given linear equations are

$$\begin{bmatrix} 4 & 3 \\ 3 & 4 \end{bmatrix} X = \begin{bmatrix} 12 \\ 12 \end{bmatrix}$$

Let $P = \begin{bmatrix} 4 & 3 \\ 3 & 4 \end{bmatrix}$,

$Q = \begin{bmatrix} 12 \\ 12 \end{bmatrix}$

$PX = Q$

$X = P^{-1}Q$

X is point of intersection

$X = \begin{bmatrix} 1.714 \\ 1.714 \end{bmatrix}$;

Variable lines passing through X is

$\begin{bmatrix} m & -1 \end{bmatrix}$X =1.714(m-1)

where m is paramter

It meets cordinate axes at A and B respectively

A=$\begin{bmatrix} a \\ 0 \end{bmatrix}$ B=$\begin{bmatrix} 0 \\ b \end{bmatrix}$

a = $1.714\frac{m-1}{m}$, b = 1.714(1-m)

The locus of midpoint of A and B is C

C=$\begin{bmatrix} x \\ y \end{bmatrix}$

x,y are $\frac{a}{2}$ and $\frac{b}{2}$ respectively

x = $\frac{0.8571(m-1)}{m}$,y = 0.8571(1-m)

$\frac{y}{x}$ = -m

xy = 0.8571(x+y)

Therefore the locus is a hyperbola whose equation is

C=$\begin{bmatrix} 0.8571(m-1)/m \\ 0.8571(1-m) \end{bmatrix}$

m is parameter.

FIGURES

The figure of locus diagram

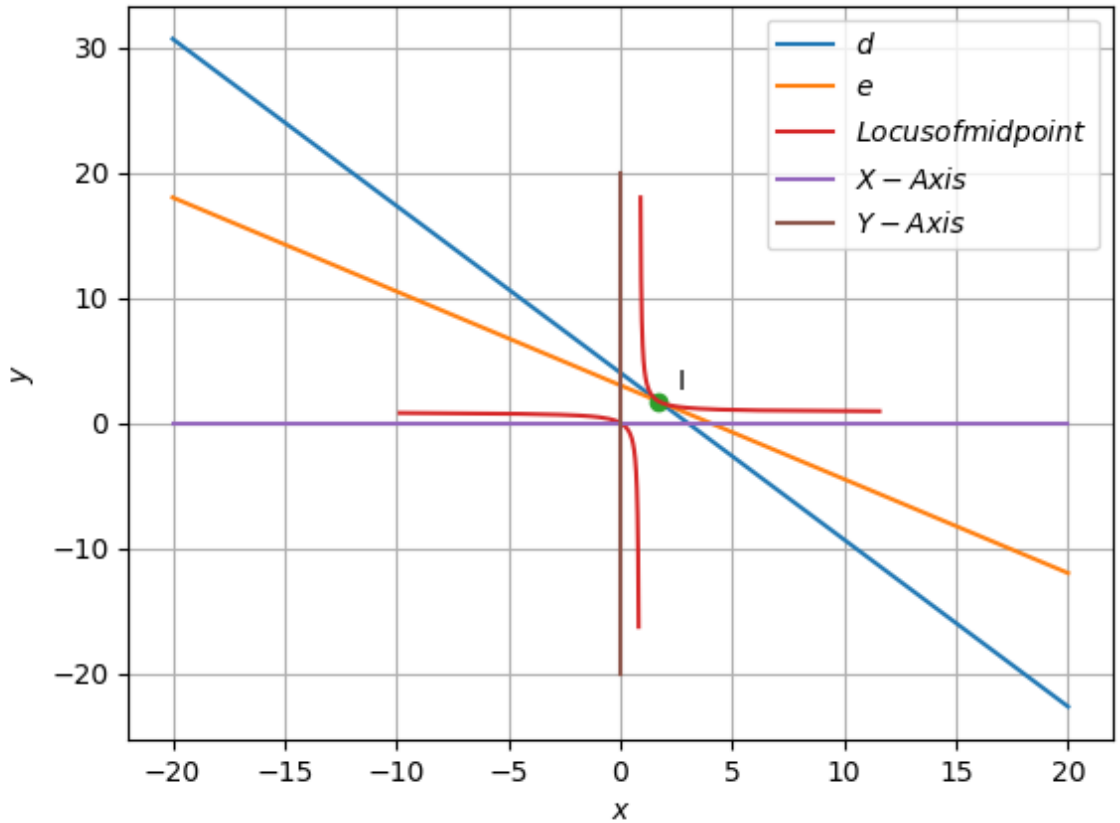

Figure: locus diagram

The figure of variable lines

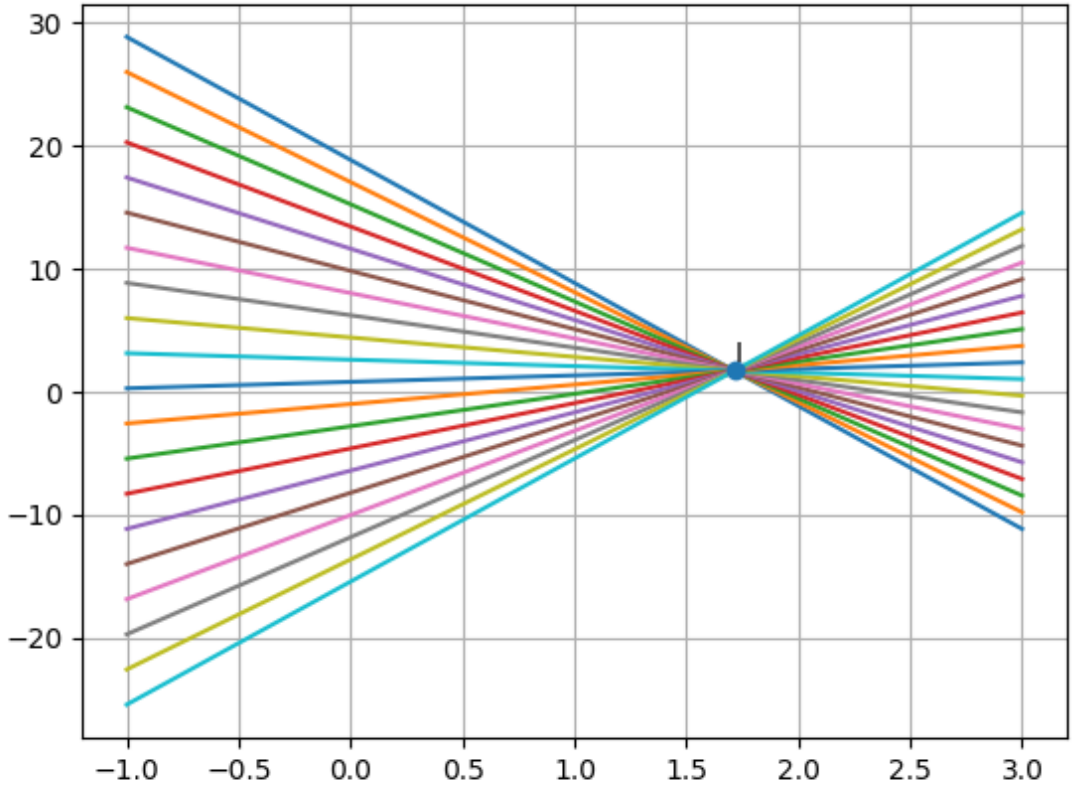

Figure: variable lines