KU LEUVEN

Matrix project

. . . Artificial Intelligence and Machine Learning

Rishitha
Adithya

Indian Institute Of Technology Hyderabad

February 15, 2019

- Geometrical form of question

Question

Find the locus of point of intersection of the straight lines:

$$tx - 2y - 3t = 0 \tag{1}$$

$$x - 2ty + 3 = 0 \tag{2}$$

EE1390

- Matrix transformation of geometrical question

Find the locus of point of intersection of straight lines:

$$\begin{bmatrix} t & -2 \end{bmatrix} X = 3t$$

$$\begin{bmatrix} 1 & -2t \end{bmatrix} X = -3$$

- solution in terms of matrices

$$\begin{bmatrix} t & -2 \end{bmatrix} X = 3t$$

$$\begin{bmatrix} 1 & -2t \end{bmatrix} X = -3$$

The point of intersection of the above lines is

$$\begin{aligned} (\mathrm{n}_1)^T X &= p_1 \\ (\mathrm{n}_2)^T X &= p_2 \end{aligned}$$

$$N^T X = P$$

where

$$N^T = \begin{bmatrix} n_1^T & n_2^T \end{bmatrix}$$

and

$$n_1^T = \begin{bmatrix} t & -2 \end{bmatrix}$$

$$n_2^T = \begin{bmatrix} 1 & -2 \end{bmatrix}$$

$$N = \begin{bmatrix} t & 1 \\ -2 & -2t \end{bmatrix}$$

We get the point of intersection from

X=(N^{-T})P

- Hence

$$N^{-T} = \frac{1}{2-2t^2}\begin{bmatrix} -2t & 2 \\ -1 & t \end{bmatrix}$$

And

$$P\begin{bmatrix} 3t \\ -3 \end{bmatrix}$$

- Therefore after solving for X ,we get

$$X = \begin{bmatrix} \frac{3(t^2+1}{t^2-1} \\ \frac{3t}{t^2-1} \end{bmatrix}$$

- Where

$$\det(N^T) = \frac{1}{2-2t^2}$$

Locus of the equation

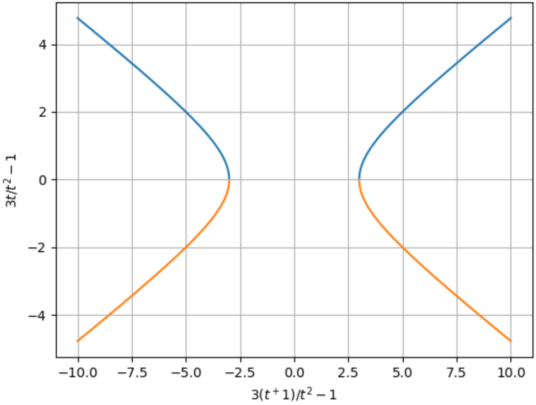

Figure: HYPERBOLA