

## **Matrix project**

*... Artificial Intelligence and Machine Learning*



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- Geometrical form of question

## Question

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

$$tx - 2y - 3t = 0 \quad (1)$$

$$x - 2ty + 3 = 0 \quad (2)$$

- 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

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

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

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

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3(t^2 + 1)/(t^2 - 1) \\ 3t/(t^2 - 1) \end{bmatrix}$$

Therefore, the required locus is a hyperbola i.e.,

$$x^2 - 4y^2 = 9 \quad (3)$$

# Locus of the equation

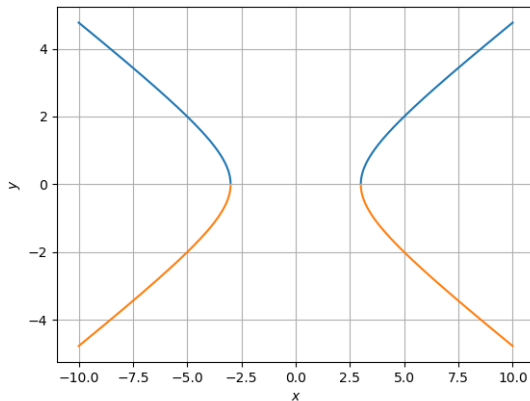


Figure: HYPERBOLA