

# Linear Algebra

[KOMS120301] - 2023/2024

## 13.4 - Intuition behind linear transformation

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# Learning objectives

- To have an intuition of the concept of linear transformation.

# Vectors transformation (1)

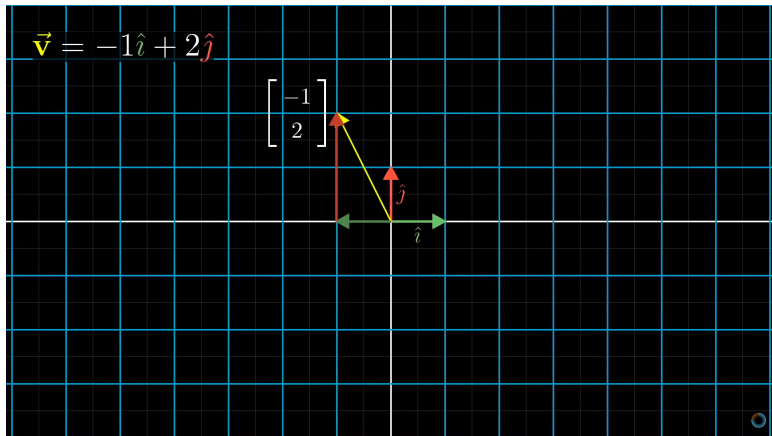


Figure: Source: Youtube of 3Blue1Brown

## Vectors transformation (2)

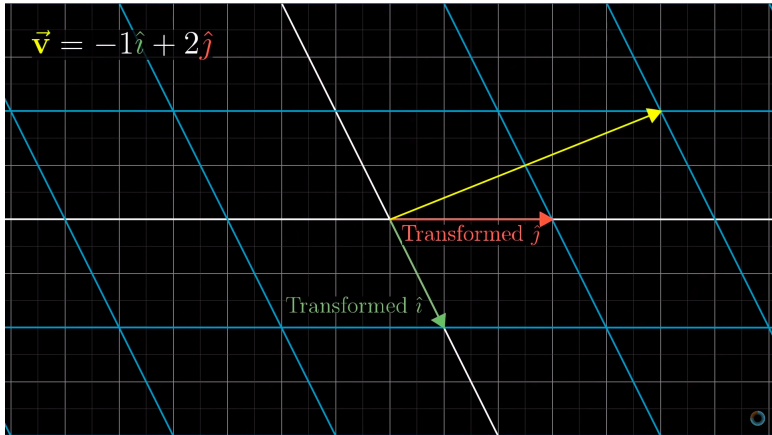


Figure: Source: Youtube of 3Blue1Brown



## Vectors transformation (3)

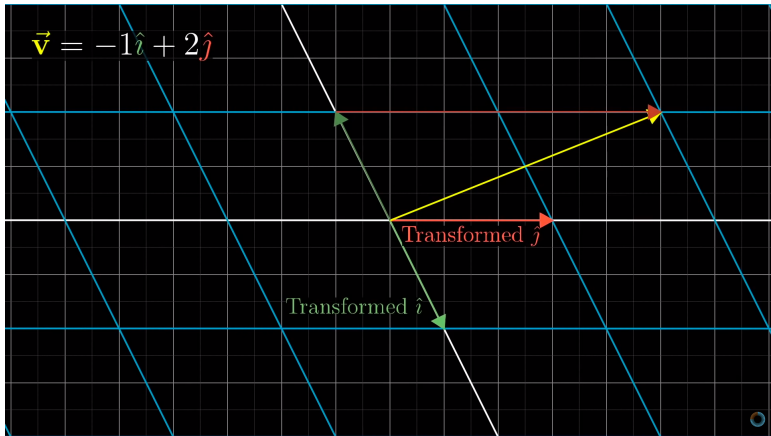


Figure: Source: Youtube of 3Blue1Brown

## Vectors transformation (4)

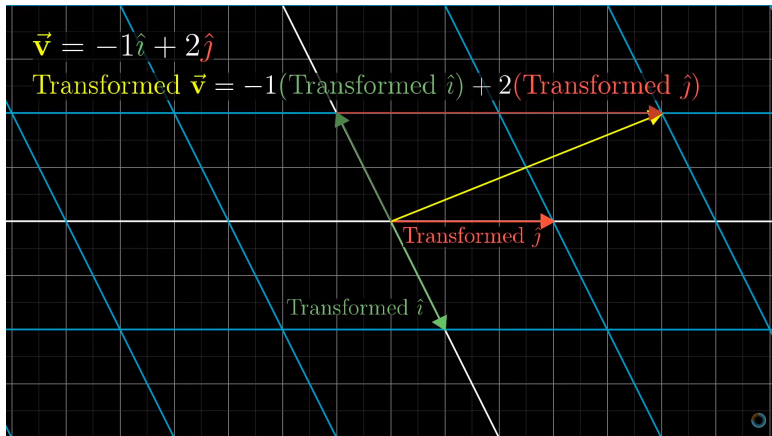


Figure: Source: Youtube of 3Blue1Brown

## Vectors transformation (5)

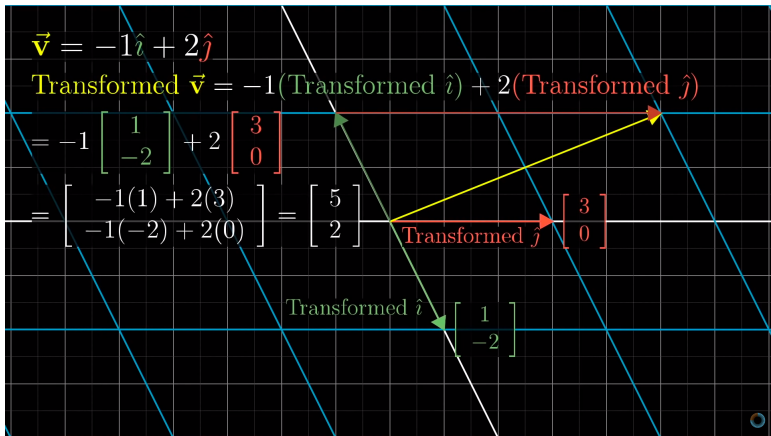


Figure: Source: Youtube of 3Blue1Brown

## Rule of transformation (1)

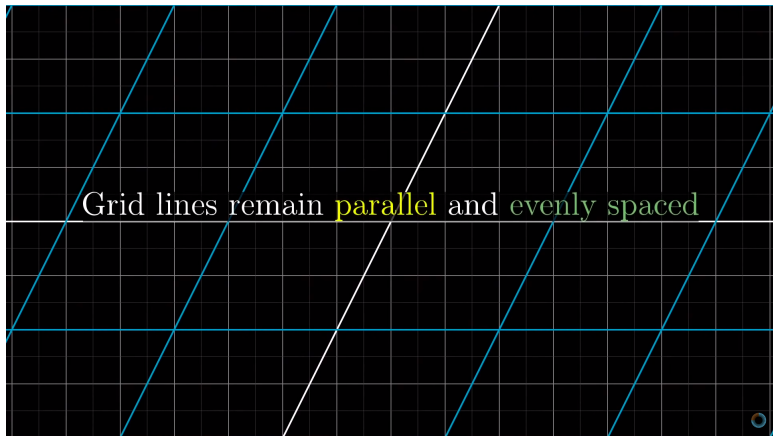


Figure: Source: Youtube of 3Blue1Brown

## Rule of transformation (2)

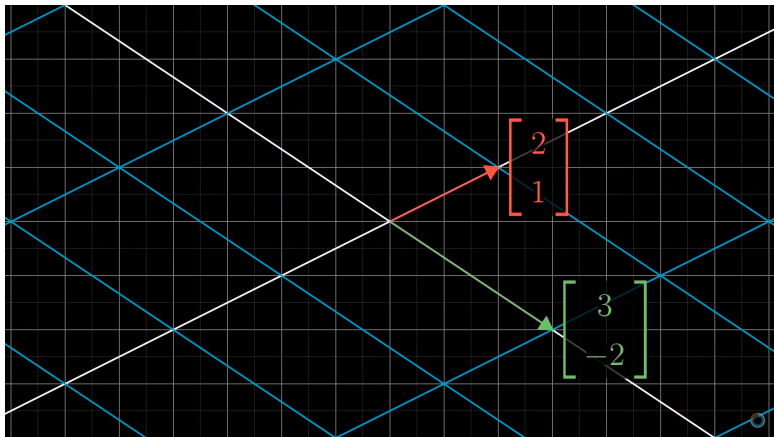


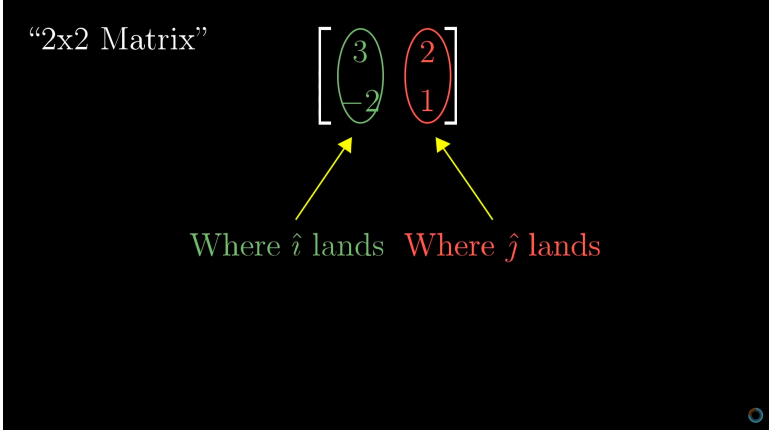
Figure: Source: Youtube of 3Blue1Brown

## Rule of transformation (3)

“2x2 Matrix”

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

Where  $\hat{i}$  lands    Where  $\hat{j}$  lands



The image shows a 2x2 matrix on a black background. The matrix is  $\begin{bmatrix} 3 & 2 \\ -2 & 1 \end{bmatrix}$ . The first column, containing the numbers 3 and -2, is enclosed in a green oval. The second column, containing the numbers 2 and 1, is enclosed in a red oval. Below the matrix, the text "Where  $\hat{i}$  lands" is written in green, and "Where  $\hat{j}$  lands" is written in red. Two yellow arrows point from the text to the corresponding columns of the matrix. The text "2x2 Matrix" is in the top left corner. A small blue and red logo is in the bottom right corner of the black area.

Figure: Source: Youtube of 3Blue1Brown

## Rule of transformation (4)

“2x2 Matrix”

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = x \begin{bmatrix} a \\ c \end{bmatrix} + y \begin{bmatrix} b \\ d \end{bmatrix} = \begin{bmatrix} ax + by \\ cx + dy \end{bmatrix}$$

Where all the intuition is

Figure: Source: Youtube of 3Blue1Brown

## Example of transformation (1)

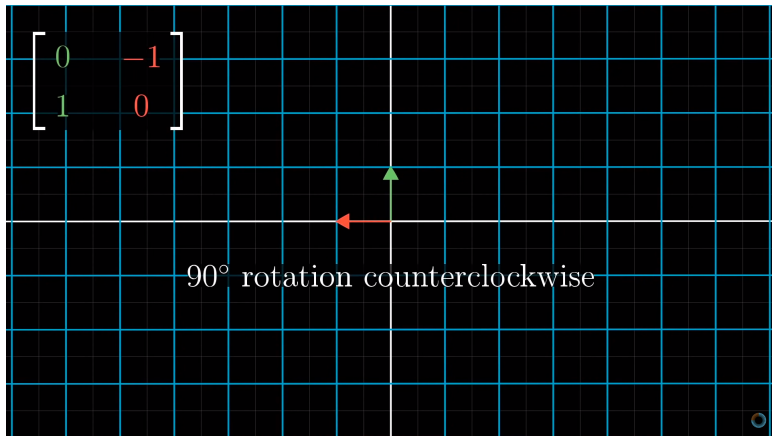


Figure: Source: Youtube of 3Blue1Brown



## Example of transformation (2)

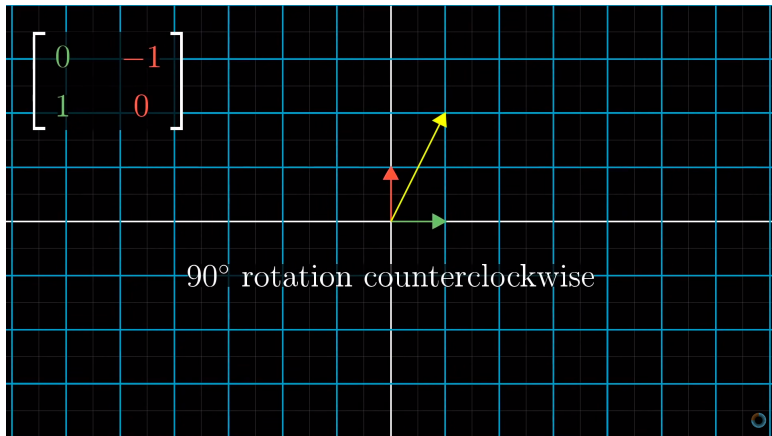


Figure: Source: Youtube of 3Blue1Brown

## Example of transformation (3)

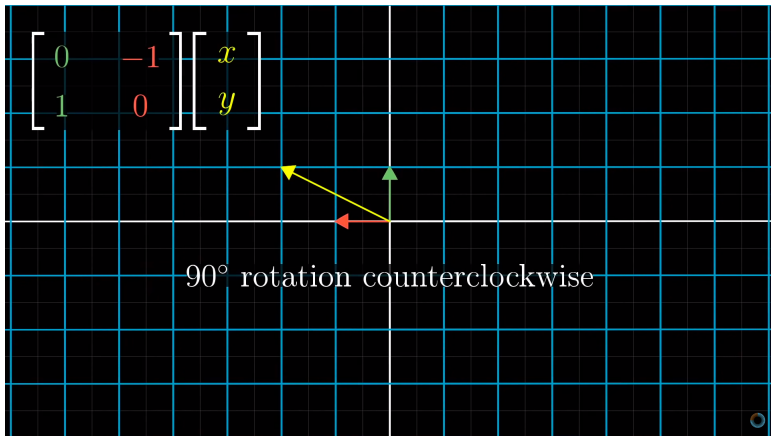


Figure: Source: Youtube of 3Blue1Brown

## Example of transformation (4)

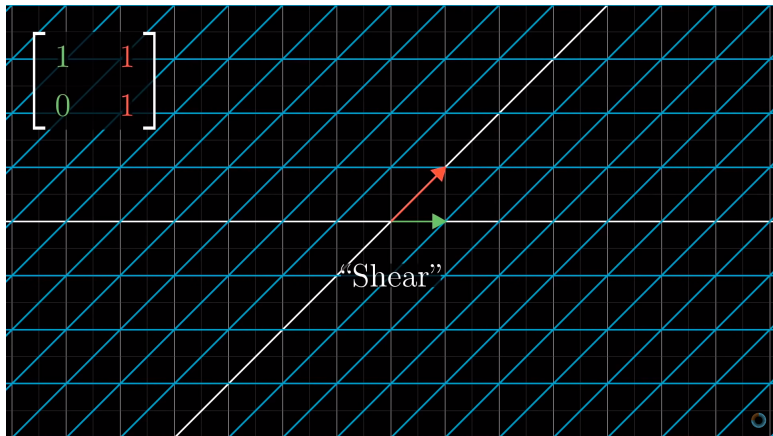


Figure: Source: Youtube of 3Blue1Brown

## Example of transformation (5)

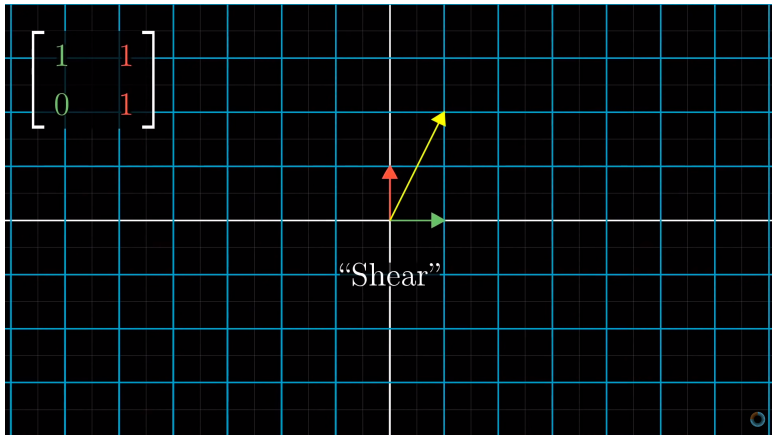


Figure: Source: Youtube of 3Blue1Brown

## Example of transformation (6)

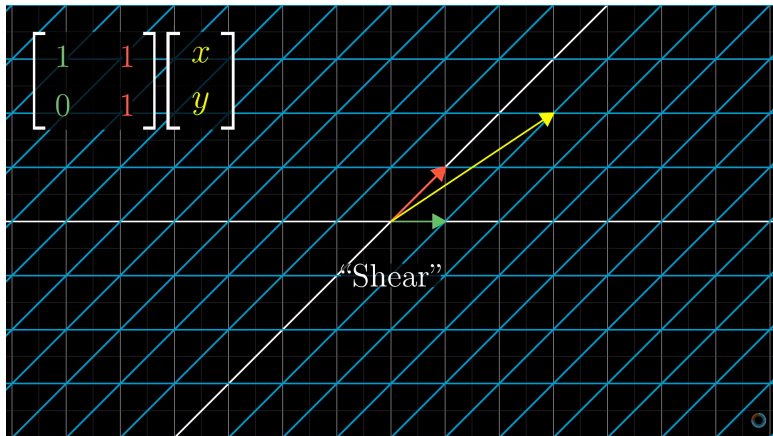


Figure: Source: Youtube of 3Blue1Brown