

L4

Matrix invers

A^{-1}

$$\underbrace{A^{-1}A}_E \cdot X = A^{-1}B$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

$$f^{-1}(f(x)) = x$$

$$A^{-1} \boxed{A \cdot X = B}$$

$$\begin{bmatrix} 3 & 2 & 5 \\ 7 & 4 & -1 \\ -5 & 7 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 7 \\ -5 \\ 0 \end{bmatrix}$$

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Essence of linear algebra

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1 Vectors vs. $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ 9:52 3Blue1Brown

2 Span 9:59 3Blue1Brown

3 Linear transformations 10:59 3Blue1Brown

4 Matrix multiplication 10:04 3Blue1Brown

5 3D transformations 4:46 3Blue1Brown

6 Determinant 10:03 3Blue1Brown

Ex 1)
$$\begin{cases} 3x + 2y = 1 \\ -x + y = 3 \end{cases}$$

Lös med A^{-1}

$$\left(\begin{array}{cc|cc} 3 & 2 & 1 & 0 \\ -1 & 1 & 0 & 1 \end{array} \right) \sim$$

$$\left(\begin{array}{cc|cc} 1 & 4 & 1 & 2 \\ -1 & 1 & 0 & 1 \end{array} \right) \sim \left(\begin{array}{cc|cc} 1 & 4 & 1 & 2 \\ 0 & 5 & 1 & 3 \end{array} \right)$$

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

$$A \cdot X = B$$
$$A^{-1} A \cdot X = A^{-1} B$$
$$X = \boxed{A^{-1} B}$$

Ex 1)

$$\begin{cases} 3x + 2y = 1 \\ -x + y = 3 \end{cases}$$

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

FUNKADE!

$$\begin{pmatrix} 3 & 2 & 1 \\ -1 & 1 & 3 \end{pmatrix} \sim \begin{pmatrix} 1 & 4 & 7 \\ -1 & 1 & 3 \end{pmatrix} \sim \begin{pmatrix} 1 & 4 & 7 \\ 0 & 5 & 10 \end{pmatrix}$$

$$\sim \begin{pmatrix} 1 & 4 & 7 \\ 0 & 1 & 2 \end{pmatrix} \sim \begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \end{pmatrix}$$

$$\begin{cases} x_1 = -1 \\ x_2 = 2 \end{cases}$$

$$\left(\begin{array}{cc|cc} 1 & 4 & 1 & 2 \\ 0 & 5 & 1 & 3 \end{array} \right) \sim \left(\begin{array}{cc|cc} 1 & 4 & 1 & 2 \\ 0 & 1 & 1/5 & 3/5 \end{array} \right) \sim$$

$$\sim \left(\begin{array}{cc|cc} 1 & 0 & 1/5 & -2/5 \\ 0 & 1 & 1/5 & 3/5 \end{array} \right)$$

$$A^{-1} = \begin{pmatrix} 1/5 & 2/5 \\ 1/5 & 3/5 \end{pmatrix}$$

$$X = A^{-1}B = \begin{pmatrix} 1/5 & -2/5 \\ 1/5 & 3/5 \end{pmatrix} \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} 1/5 + (-6/5) \\ 1/5 + 9/5 \end{pmatrix} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \begin{matrix} x_1 \\ x_2 \end{matrix}$$







