

2h. 2024.10.17

⑥

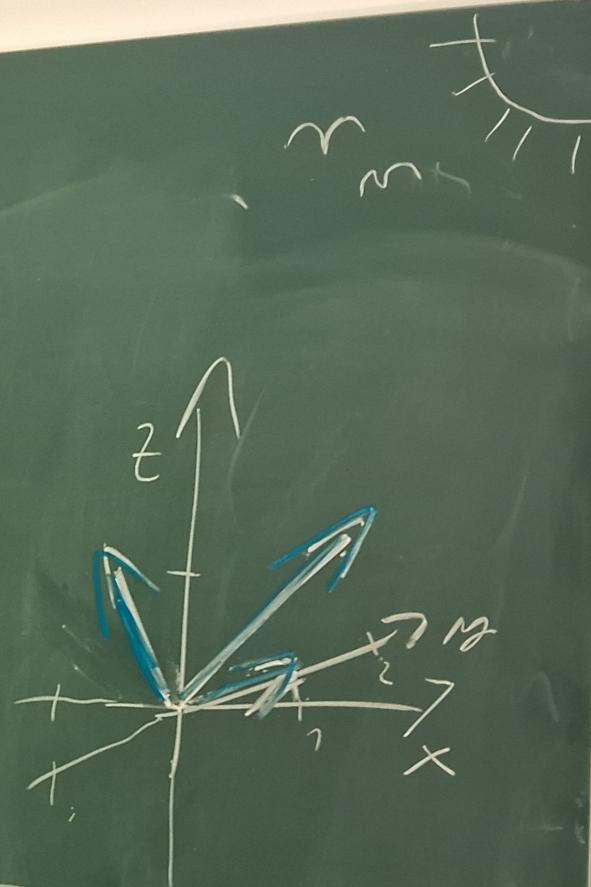
$$k_1 \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix} + k_2 \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} + k_3 \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix} = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$$

$$\left. \begin{array}{l} -x_1 + x_3 = -1 \\ x_1 + x_2 + 2x_3 = 0 \end{array} \right\}$$

$$\left. \begin{array}{l} x_1 + x_3 = 0 \end{array} \right\} \rightarrow x_3 = -x_1$$

$$\left. \begin{array}{l} -2x_1 = -1 \\ x_1 + x_2 - 2x_1 = 0 \\ x_1 - x_1 = 0 \end{array} \right\} \rightarrow \frac{x_1 = \frac{1}{2}}{x_2 - x_1 = 0} \rightarrow$$

$$\left. \begin{array}{l} x_2 = \frac{1}{2} \\ x_3 = -\frac{1}{2} \end{array} \right\} \rightarrow x_1 = \frac{1}{2}$$



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$$x_1 \begin{pmatrix} 2 \\ 0 \\ 1 \\ 1 \end{pmatrix} + x_2 \begin{pmatrix} 3 \\ 2 \\ 0 \\ 2 \end{pmatrix} + x_3 \begin{pmatrix} 4 \\ 1 \\ 1 \\ 0 \end{pmatrix} + x_4 \begin{pmatrix} 2 \\ 1 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 5 \\ 1 \\ 2 \\ 4 \end{pmatrix}$$
$$A = \begin{pmatrix} 2 & 3 & 4 & 2 \\ 0 & 2 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 2 & 0 & 0 \end{pmatrix}$$

$$\left\{ \begin{array}{l} 2x_1 + 3x_2 + 4x_3 + 2x_4 = 5 \\ 2x_2 + x_3 + x_4 = 1 \\ x_1 + x_3 = 2 \\ x_1 + 2x_2 = 4 \end{array} \right.$$
$$\underline{\underline{A \cdot x = b}}$$
$$\underline{\underline{A^{-1} \cdot A \cdot x = A^{-1} \cdot b}}$$
$$\underline{\underline{x = A^{-1} \cdot b}}$$

$$\begin{pmatrix} 2 & 3 & 4 & 2 \\ 0 & 2 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 2 & 0 & 0 \end{pmatrix} \begin{pmatrix} 5 \\ 1 \\ 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 2-4-4+1 \\ -1+2+2+0 \\ -2+4+5-1 \\ 1+2-9+1 \end{pmatrix} = \begin{pmatrix} 5 \\ 1 \\ 2 \\ 4 \end{pmatrix}$$
$$\begin{pmatrix} 2 \\ 1 \\ 0 \\ -1 \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$$

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$$f(x) = \begin{pmatrix} 2x_1 + x_2 \\ -x_1 + x_2 \\ x_3 + 7x_2 \\ -x_3 \end{pmatrix}$$

(I)  $f(g+b) = \begin{pmatrix} 2a_1 + 2b_1 + a_2 + b_2 \\ -a_1 - b_1 + a_2 + b_2 \\ a_3 + b_3 + 7a_2 + 7b_2 \\ -a_3 \end{pmatrix} = \begin{pmatrix} 2a_1 + a_2 \\ -a_1 + a_2 \\ a_3 + 7a_2 \\ -b_3 \end{pmatrix} + \begin{pmatrix} 2b_1 + b_2 \\ -b_1 + b_2 \\ b_3 + 7b_2 \\ -b_3 \end{pmatrix} = \underline{\underline{f(a) + f(b)}}$

(II)  $f(\lambda a) = \begin{pmatrix} -a_3 - b_3 \\ 2\lambda a_1 + \lambda a_2 \\ \lambda a_3 + 7\lambda a_2 \\ -\lambda a_3 \end{pmatrix} = \lambda \begin{pmatrix} -a_3 \\ 2a_1 + a_2 \\ a_3 + 7a_2 \\ -a_3 \end{pmatrix} = \underline{\underline{\lambda f(a)}} = \begin{pmatrix} 2 & 1 & 0 & 0 \\ -1 & 1 & 0 & 0 \\ 0 & 2 & 1 & 0 \\ 0 & 0 & -1 & 0 \end{pmatrix}$

I.  $\forall a, b \in \mathbb{R}^4$

$$f(a+b) = f(a) + f(b)$$

II.  $\forall \lambda \in \mathbb{R}, \forall a \in \mathbb{R}^3$

$$f(\lambda a) = \lambda \cdot f(a)$$

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$$f(x) = \begin{pmatrix} x_1 \\ -3x_1 \cdot x_2 \\ 5x_2 \\ -x_1 \end{pmatrix}$$

$$f(a+b) = \begin{pmatrix} (a_1+b_1) \\ -3(a_1+b_1)(a_2+b_2) \\ 5(a_2+b_2) \\ -(a_1+b_1) \end{pmatrix}$$

$$= \begin{pmatrix} a_1+b_1 \\ -3a_1a_2 - 3a_1b_2 - 3b_1a_2 - 3b_1b_2 \\ 5a_2 + 5b_2 \\ -a_1 - b_1 \end{pmatrix}$$

\$ \hookrightarrow \$

$$a_1a_2 + a_1b_2 + b_1a_2 + b_1b_2$$

Element 73 add.

73 trans. matrix