

0 0 0 - 14

$$\left(\begin{array}{cccc} 24 & 19 & 36 & 72 \\ 49 & 40 & 73 & 147 \\ 73 & 59 & 98 & 29 \\ 47 & 36 & 71 & 141 \end{array} \right) \xrightarrow{-3I + 2II} \left(\begin{array}{cccc} 24 & 19 & 36 & 72 \\ 49 & 40 & 73 & 147 \\ 73 & 59 & 98 & 29 \\ 47 & 36 & 71 & 141 \end{array} \right)$$

$$\xrightarrow{-2I} \left(\begin{array}{cccc} 24 & 19 & 36 & 72 \\ 49 & 40 & 73 & 147 \\ 73 & 59 & 98 & 29 \\ 47 & 36 & 71 & 141 \end{array} \right) \xrightarrow{3 \cdot I} \left(\begin{array}{cccc} 24 & 19 & 36 & 72 \\ 49 & 40 & 73 & 147 \\ 73 & 59 & 98 & 29 \\ 47 & 36 & 71 & 141 \end{array} \right) \xrightarrow{-2I}$$

$$\sim \left(\begin{array}{cccc} 24 & 19 & 36 & 1 \\ 1 & 2 & 1 & 0 \\ 1 & 2 & -10 & 0 \\ 1 & -2 & 1 & 0 \end{array} \right) \xrightarrow{+IV} \left(\begin{array}{cccc} 24 & 19 & 36 & 1 \\ 1 & 2 & 1 & 0 \\ 0 & 0 & -10 & 1 \end{array} \right)$$

$$= \eta(A) = 3$$

$$Q_1 = (1, 2)$$
$$Q_2 = (1, 2)$$
$$Q_3 = (3, 6)$$

$$a_1 = (1, 0, 0, 2, 5)$$

$$a_2 = (0, 1, 0, 3, 4)$$

$$a_3 = (0, 0, 1, 4, 7)$$

$$a_4 = (2, -3, 4, 11, 12)$$

$$\begin{array}{cc} \text{№ 8000} & \text{-2I} \\ \left(\begin{array}{ccccc} 1 & 0 & 0 & 2 & \\ 0 & 1 & 0 & -3 & \\ 0 & 0 & 1 & 4 & \\ 2 & 3 & 4 & 11 & \\ 5 & 4 & 7 & 12 & \end{array} \right) & \sim \\ & \left(\begin{array}{ccccc} 1 & 0 & 0 & 2 & \\ 0 & 1 & 0 & -3 & \\ 0 & 0 & 1 & 4 & \\ 0 & 0 & 4 & 16 & \\ 0 & 0 & 7 & 14 & \end{array} \right) \xrightarrow{-4 \cdot \text{II}} \\ & \left(\begin{array}{ccccc} 1 & 0 & 0 & 2 & \\ 0 & 1 & 0 & -3 & \\ 0 & 0 & 1 & 4 & \\ 0 & 0 & 0 & 16 & \\ 0 & 0 & 0 & -14 & \end{array} \right) \xrightarrow{-7 \cdot \text{III}} \end{array}$$

$$\sim \left(\begin{array}{ccccc} 1 & 0 & 0 & 0 & \\ 0 & 1 & 0 & -3 & \\ 0 & 0 & 1 & 4 & \\ 0 & 0 & 0 & 16 & \\ 0 & 0 & 0 & -14 & \end{array} \right) \sim \left(\begin{array}{ccccc} 1 & 0 & 0 & 0 & \\ 0 & 1 & 0 & -3 & \\ 0 & 0 & 1 & 4 & \\ 0 & 0 & 0 & 16 & \\ 0 & 0 & 0 & -14 & \end{array} \right) \sim$$

$$\left(\begin{array}{ccccc} 1 & 0 & 0 & 0 & \\ 0 & 1 & 0 & -3 & \\ 0 & 0 & 1 & 4 & \\ 0 & 0 & 0 & 16 & \\ 0 & 0 & 0 & -14 & \end{array} \right) \sim \left(\begin{array}{ccccc} 1 & 0 & 0 & 0 & \\ 0 & 1 & 0 & -3 & \\ 0 & 0 & 1 & 4 & \\ 0 & 0 & 0 & 16 & \\ 0 & 0 & 0 & -14 & \end{array} \right) \Rightarrow \text{r}(A) = 4 - 4$$

Вектори січні
ко исчезли.

$$a_1 = (1, 2, 0, 0)$$

$$a_2 = (1, 2, 3, 4)$$

$$a_3 = (3, 6, 0, 0)$$

$$\begin{array}{cc} \text{№ 873} & -3\text{I} \\ \left(\begin{array}{cccc} 1 & 1 & 3 & \\ 1 & 2 & 6 & \\ 0 & 3 & 0 & \\ 0 & 4 & 0 & \end{array} \right) & \sim \end{array}$$

$$\left(\begin{array}{cccc} 1 & 1 & 3 & \\ 0 & 1 & 3 & \\ 0 & 0 & 1 & \\ 0 & 0 & 0 & \end{array} \right) \sim \left(\begin{array}{cccc} 1 & 1 & 3 & \\ 0 & 1 & 3 & \\ 0 & 0 & 1 & \\ 0 & 0 & 0 & \end{array} \right)$$

$$\sim \left(\begin{array}{cccc} 1 & 2 & 0 & 0 \\ 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 0 \end{array} \right) \sim \left(\begin{array}{cccc} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{array} \right) \sim \left(\begin{array}{cccc} 1 & 0 & 3 & 4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{array} \right)$$

$\text{r}(A) = 3 \leq 3$ - вектори січні ко исчезли.

$a_1, a_2 - 3a_3, 4 = 2 \Rightarrow$ буде одна січн. вектор
векторів буде один. Базиси: $(a_1, a_2), (a_2, a_3)$

$$x_1 = \frac{-2}{11}$$

$$x_2 = \frac{10}{11} -$$

$$x_3 = 0$$

$$\left\{ \begin{array}{l} 3x_1 + \\ 6x_2 + \\ 9x_3 + \end{array} \right.$$

$$\left\{ \begin{array}{l} 2x_1 + 7x_2 + 3x_3 + x_4 = 6 \\ 3x_1 + 5x_2 + 2x_3 + 2x_4 = 4 \\ 9x_1 + 4x_2 + x_3 + 7x_4 = 2 \end{array} \right.$$

$$\left(\begin{array}{cccc|c} 2 & 7 & 3 & 1 & 6 \\ 3 & 5 & 2 & 2 & 4 \\ 9 & 4 & 1 & 7 & 2 \end{array} \right) \xrightarrow{\begin{array}{l} R_1 \rightarrow R_1 - 3R_2 \\ R_2 \rightarrow R_2 - R_1 \\ R_3 \rightarrow R_3 - 4R_1 \end{array}} \left(\begin{array}{cccc|c} 2 & 7 & 3 & 1 & 6 \\ 0 & -2 & -5 & 1 & -2 \\ 0 & -25 & -25 & 25 & -25 \end{array} \right) \xrightarrow{\begin{array}{l} R_1 \rightarrow R_1 - R_2 \\ R_3 \rightarrow R_3 - 12R_2 \end{array}} \left(\begin{array}{cccc|c} 2 & 0 & -2 & 0 & 14 \\ 0 & -2 & -5 & 1 & -2 \\ 0 & 0 & 5 & 1 & 5 \end{array} \right) \xrightarrow{\begin{array}{l} R_1 \rightarrow R_1 / 2 \\ R_2 \rightarrow R_2 / (-2) \\ R_3 \rightarrow R_3 / 5 \end{array}} \left(\begin{array}{cccc|c} 1 & 0 & -1 & 0 & 7 \\ 0 & 1 & 2.5 & -0.5 & 1 \\ 0 & 0 & 1 & 0.2 & 1 \end{array} \right)$$

$$\sim \left(\begin{array}{ccc|c} 2 & 3 & 1 & 6 \\ 0 & 1 & -5 & 1 \\ 0 & -11 & -5 & -10 \end{array} \right) \xrightarrow{\text{II} \cdot (-1)} \left(\begin{array}{ccc|c} 2 & 3 & 1 & 6 \\ 0 & 1 & -5 & 1 \\ 0 & 0 & 0 & 0 \end{array} \right)$$

$\Rightarrow x_4, x_2, x_1 - \text{Solutions}$

$$x_4 = 0$$

$$x_2 + 5x_3 = 10$$

$$x_2 = \frac{10 - 5x_3}{11}$$

$$x_1 + 7x_2 + 3x_3 = 6$$

$$x_1 = 6 - 7x_2 - 3x_3$$

$$x_1 = 6 - \frac{70 - 35x_3}{11} - 3x_3$$

$$x_1 = \frac{1}{11} \left(6 - \frac{70 - 35x_3}{11} \right) = 3 - \frac{35 - 34x_3}{11} = \frac{-2 - 34x_3}{11}$$

$$x_3 \in \mathbb{R}$$

$$x_3 = 0$$

$$x_1 = \frac{-2}{11}$$

$$x_2 = \frac{10}{11} - \frac{5}{11} \cdot \frac{-2}{11} = \frac{110 + 10}{121} = \frac{120}{121}$$

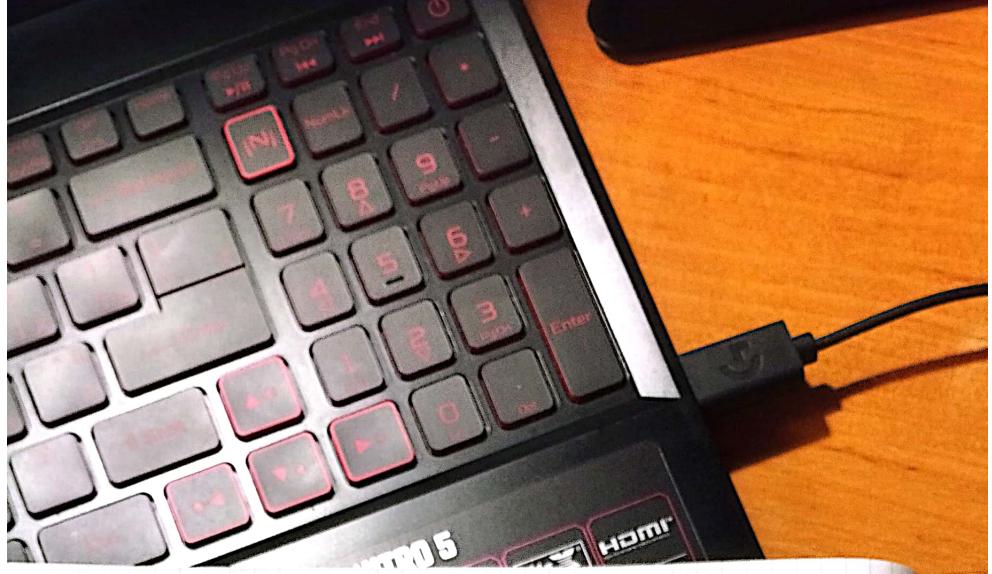
$$x_4 = 0$$

Solutions

$$\begin{cases} 3x_1 + 4x_2 + x_3 + 2x_4 = 3 \\ 6x_1 + 8x_2 + 2x_3 + 6x_4 = 7 \\ 9x_1 + 12x_2 + 3x_3 + 10x_4 = 13 \end{cases}$$

$$\left(\begin{array}{cccc|c} 3 & 4 & 1 & 2 & 3 \\ 6 & 8 & 2 & 5 & 7 \\ 9 & 12 & 3 & 10 & 13 \end{array} \right)$$

$$\xrightarrow[-2]{\text{I}} \left(\begin{array}{cccc|c} 3 & 4 & 1 & 2 & 3 \\ 0 & 4 & 0 & 1 & 1 \\ 9 & 12 & 3 & 10 & 13 \end{array} \right) \xrightarrow[-3]{\text{III}}$$



$$\left(\begin{array}{ccc|c} 3 & 4 & 1 & 2 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 4 \end{array} \right) \xrightarrow{-4 \cdot \bar{I}} \sim \left(\begin{array}{ccc|c} 3 & 4 & 1 & 2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{array} \right)$$

т.е. x_1, x_2, x_4 - базиси,

$$x_3 = 1, \quad x_2 = 0$$

$$3x_1 + x_3 + 2 = 3$$

$$x_1 = \frac{1-x_3}{3}$$

$$x_3 \in \mathbb{R}$$

$$\text{Нека } \bar{x}_3 = 0$$

$$x_1 = \frac{1}{3}$$

$$x_1 = \frac{1}{3}, \quad x_2 = 0, \quad x_3 = 0, \quad x_4 = 1 - \text{частный решений.}$$

N 715

$$\begin{cases} 2x_1 - x_2 + 3x_3 + 4x_4 = 5 \\ 4x_1 - 2x_2 + 5x_3 + 6x_4 = 7 \\ 6x_1 - 3x_2 + 7x_3 + 8x_4 = 9 \\ 9x_1 - 4x_2 + 9x_3 + 10x_4 = 11 \end{cases} \xrightarrow{\text{I} - 2\cdot\text{II}}$$

$$\sim \left(\begin{array}{cccc|c} 2 & -1 & 3 & 4 & 5 \\ 0 & 0 & -1 & -2 & -3 \\ 0 & 0 & -2 & -4 & -6 \\ 6 & -3 & 7 & 8 & 9 \end{array} \right) \xrightarrow{\text{III} - 3\cdot\text{II}}$$

$$\sim \left(\begin{array}{cccc|c} 2 & -1 & 3 & 4 & 5 \\ 0 & 0 & -1 & -2 & -3 \\ 0 & 0 & -1 & -2 & -6 \\ 0 & -3 & 1 & 2 & 9 \end{array} \right) \xrightarrow{\text{IV} + 3\cdot\text{III}}$$

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

$$\sim \left(\begin{array}{cccc|c} 2 & -1 & 3 & 4 & 5 \\ 0 & 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right) \xrightarrow{\text{III} - \text{II}}$$

$$\sim \left(\begin{array}{cccc|c} 2 & -1 & 3 & 4 & 5 \\ 0 & 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right) \quad \text{При } x_3 \in \mathbb{R}, \quad \text{решение}$$

flexan $\lambda = -8$:

$$\frac{-8+8}{3} = 0$$

$$\underline{0=0}$$

x_1, x_3 - cagereca.

$$x_3 + 2x_4 = 3$$

$$\underline{x_3 = 3 - 2x_4}$$

$$2x_1 - 2x_2 + 3x_3 + 4x_4 = 5$$

$$2x_1 = 5 - x_2 - 3 + \cancel{2x_4} - 4x_4$$

$$2x_1 = 5 - x_2 - 3 - 2x_4 ; x_1 = \frac{5 - x_2 - 3 - 2x_4}{2}$$

$$x_2, x_4 \in \mathbb{R}$$

$$x_2 = x_4 = 0$$

$$\underline{\frac{x_3 = 3}{x_1 = \frac{5 - 3}{2} = 1}}$$

$$x_2, x_4 \in \mathbb{R}$$

$x_1 = 1, x_2 = x_4 = 0, x_3 = 3$ - часткеви розброяко.

$\sqrt{725}$

$$\begin{cases} 2x_1 - 4x_2 + 5x_3 + 3x_4 = 0 \\ 3x_1 - 6x_2 + 4x_3 + 2x_4 = 0 \\ 4x_1 - 8x_2 + 17x_3 + 11x_4 = 0 \end{cases}$$

~~2.1~~

$$\sim \left(\begin{array}{cccc|c} 2 & -4 & 5 & 3 \\ 3 & -6 & 4 & 2 \\ 4 & -8 & 17 & 11 \end{array} \right) \sim \left(\begin{array}{cccc|c} 1 & -2 & \frac{5}{2} & \frac{3}{2} \\ 3 & -6 & 4 & 2 \\ 4 & -8 & 17 & 11 \end{array} \right) \sim \left(\begin{array}{cccc|c} 1 & -2 & \frac{5}{2} & \frac{3}{2} \\ 0 & 0 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & \frac{29}{2} & \frac{17}{2} \end{array} \right) \sim \left(\begin{array}{cccc|c} 1 & -2 & \frac{5}{2} & \frac{3}{2} \\ 0 & 0 & -1 & -1 \\ 0 & 0 & 29 & 17 \end{array} \right) \sim \left(\begin{array}{cccc|c} 1 & -2 & 0 & 0 \\ 0 & 0 & -1 & -1 \\ 0 & 0 & 1 & \frac{17}{29} \end{array} \right) \sim \left(\begin{array}{cccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & \frac{17}{29} \end{array} \right)$$

$$\sim \left(\begin{array}{cccc} 2 & -4 & 5 & 3 \\ 0 & 0 & -\frac{7}{2} & -\frac{5}{2} \\ 0 & 0 & 7 & 5 \end{array} \right) \cdot (6) \sim \left(\begin{array}{cccc} (2) & -4 & 5 & 3 \\ 0 & 0 & 7 & 5 \end{array} \right)$$

$$x_1, x_3 \Rightarrow \text{одн. сист.}, x_3 = \frac{-5x_4}{7}$$

$$2x_1 - 4x_2 + 5x_3 + 3x_4 \Rightarrow x_1 = \frac{4x_2 - 5x_4}{2} =$$

$$= \frac{4x_2 - 5x_4}{2} - \frac{5}{2} \left(\frac{-5x_4}{7} \right) = \frac{4x_2 - 3x_4}{2} + \frac{25x_4}{14} = \frac{28x_2 - 21x_4}{14}$$

$$= \frac{28x_2 + 4x_4}{14} = \frac{14x_2 + 2x_4}{7}$$

$\varphi(CP)$:

x_1	x_2	x_3	x_4
0	2	0	0
0	0	1 - $\frac{10}{7}$	$\sqrt{\frac{62}{7}}$

$$\left\{ \begin{array}{l} 6x_1 - 2x_2 + 2x_3 + 5x_4 + 7x_5 = 0 \\ 9x_1 - 3x_2 + 4x_3 + 8x_4 + 9x_5 = 0 \\ 6x_1 - 2x_2 + 6x_3 + 7x_4 + x_5 = 0 \\ 3x_1 - x_2 + 4x_3 + 4x_4 - x_5 = 0 \end{array} \right.$$

$$\sim \left(\begin{array}{ccccc} 6 & -2 & 2 & 5 & 7 \\ 9 & -3 & 4 & 8 & 9 \\ 6 & -2 & 6 & 7 & 1 \\ 3 & -1 & 4 & 4 & -1 \end{array} \right) \sim$$

$$\sim \left(\begin{array}{ccccc} 3 & -1 & 4 & 4 & -1 \\ 6 & -2 & 2 & 5 & 7 \\ 9 & -3 & 4 & 8 & 9 \\ 6 & -2 & 6 & 7 & 1 \end{array} \right) \sim$$

$$\sim \left(\begin{array}{ccccc} 0 & 0 & -6 & -3 & 9 \\ 0 & 0 & -8 & -4 & 12 \\ 0 & 0 & -2 & -1 & 3 \end{array} \right) \sim$$

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

$$\sim (3) - 1 \quad 4 \quad 4 \quad -1$$

$$\sim (0 \quad 0 \quad 2 \quad 1 \quad -3); x_1, x_3 - \text{одн. сист.}$$

$$x_3 = \frac{3x_5 - x_4}{2}$$

$$x_1 = \frac{x_2 - 4x_3 - 4x_4 + x_5}{3} = \frac{x_2 - 4x_4 + 2x_5}{3} - \frac{4}{3} \cdot \frac{3x_5 - x_4}{2}$$

$$= \frac{x_2 - 4x_4 + x_5 - 6x_5 + 2x_4 - x_2 - 2x_4 - 5x_5}{3}$$

РПД:

x_1	x_2	x_3	x_4	x_5
1	3	0	0	0
-2	0	-1.5	3	0
-5	0	7.5	0	3

$x_2, x_4, x_5 \in \mathbb{R}$

15781

$$\begin{pmatrix} 3 & 8 & -4 \\ 6 & 9 & -5 \\ 4 & 7 & -3 \end{pmatrix} \cdot \begin{pmatrix} 3 & 2 & 5 \\ 4 & -1 & 3 \\ 9 & 6 & 5 \end{pmatrix} =$$

$$= \begin{pmatrix} 15+32-36 & 10-8-24 & 25+24-20 \\ 18+36-45 & 12-9-30 & 30+27-25 \\ 12+28-27 & 8-7-18 & 20+21-15 \end{pmatrix} =$$

$$= \begin{pmatrix} 14 & -22 & 29 \\ 3 & -27 & 32 \\ 13 & -17 & 26 \end{pmatrix}$$

15808

$$\begin{pmatrix} 17 & -6 \\ 35 & -12 \end{pmatrix}^5 ; \quad \begin{pmatrix} 17 & -6 \\ 35 & -12 \end{pmatrix} = A ; \quad A = \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}$$

$$A = BCD \cdot \overline{B} \cdot \overline{C} \cdot \overline{D} \cdot \overline{B} \cdot \overline{C} \cdot \overline{D}$$

$$BC = \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix} = \begin{pmatrix} 4 & 9 \\ 10 & 21 \end{pmatrix}$$

$$C^5 = \begin{pmatrix} 3 & 2 & 0 \\ 0 & 2 & 3 \end{pmatrix}^5 ; \quad BCD^5 = \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix} \begin{pmatrix} 3 & 2 & 0 \\ 0 & 2 & 3 \end{pmatrix}^5 \begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix} =$$

$$\begin{aligned}
 &= \begin{pmatrix} 64 & 0 \\ 0 & 1701 \end{pmatrix} \cdot \begin{pmatrix} -7 & 3 \\ 5 & -2 \end{pmatrix} = \begin{pmatrix} -448 & 0 \\ 0 & 25001 \end{pmatrix} \\
 &= \begin{pmatrix} 64 & 729 \\ 160 & 1701 \end{pmatrix} \cdot \begin{pmatrix} -7 & 3 \\ 5 & -2 \end{pmatrix} = \\
 &= \begin{pmatrix} -448 + 3695 & 192 - 1458 \\ -1120 + 8505 & 480 - 3402 \end{pmatrix} = \\
 &= \begin{pmatrix} 3197 & -1266 \\ 7385 & -922 \end{pmatrix}
 \end{aligned}$$