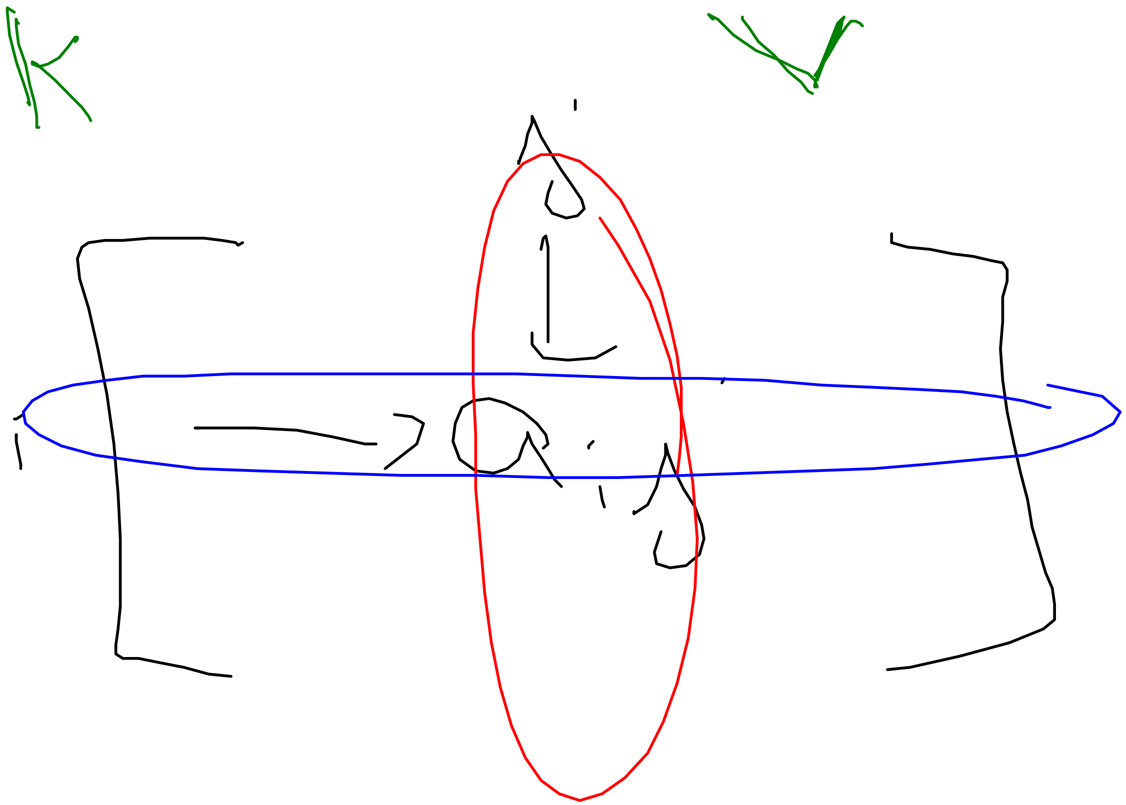
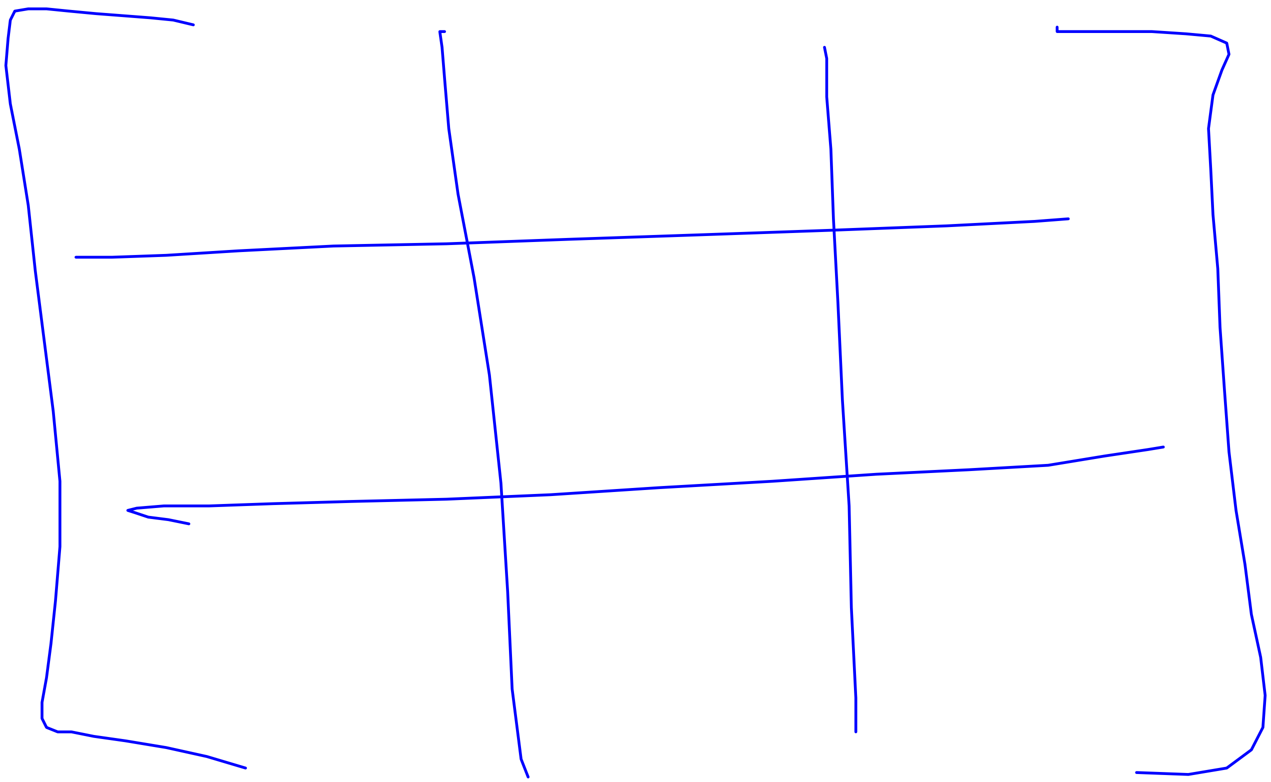
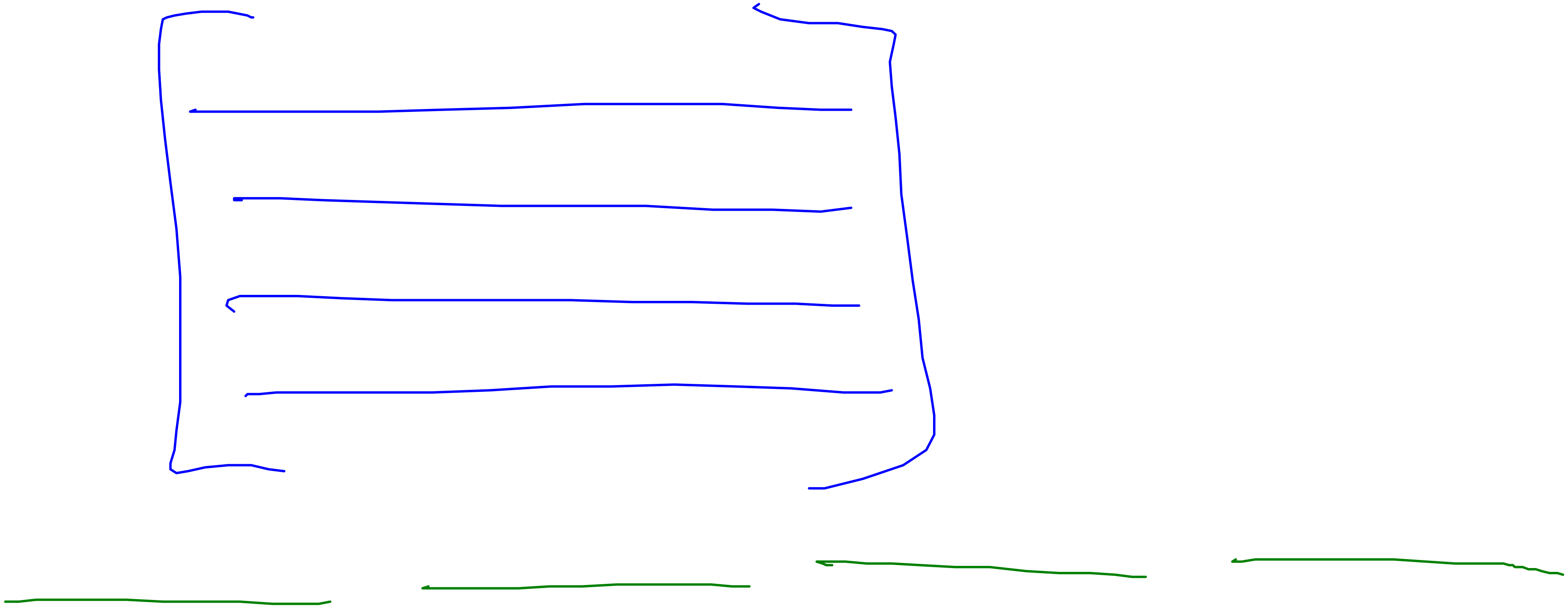






$$x \cdot y = x_1 y_1 + x_2 y_2 + \dots + x_n y_n$$

$$(x + x') \cdot y = \left((x_1, \dots, x_n) + (x_1', \dots, x_n') \right) \cdot y$$

$$= \left(x_1 + x_1', \; x_2 + x_2', \; \dots, \; x_n + x_n' \right)$$

$$= (x_1 + x_1') \cdot y_1 + \dots \dots (x_n + x_n') \cdot y_n =$$

$$= x_1 \cdot y_1 + x_1' y_1 + \dots + x_n y_n + x_n' y_n$$

$$= x \cdot y + x' y$$

$$x \cdot y \overset{?}{=} y^T x^T$$

$$\parallel$$

$$\sum_{i=1}^{n} x_i \cdot y_i = \sum_{i=1}^{n} y_i x_i = (y_1, \ldots, y_n) \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix}$$

$$r_i(A\cdot B) = \left(r_i(A)\cdot c_1(B), \ldots, r_i(A)\, c_h(B) \right)$$

A B

$m \times n$ $n \times h$

$$A\cdot B = \left(r_i(A)\, c_k(A) \right)$$

$$r_i(A)\cdot B = \left(r_i(A)\cdot c_k(A) \right)_{k=1}^{h}$$

$$A \cdot (B + B') = \left(\cap_i(A) \supset_R (B + B') \right)$$

$$= \left(\cap_i(A) \cdot \left(\supset_R(B) + \supset_R(B') \right) \right) =$$

$$= \left(\cap_i(A) \supset_R(B) + \cap_i(A) \supset_R(B') \right)$$

$$= \left(\cap_i(A) \supset_R(B) \right) + \left(\cap_i(A) \supset_R(B') \right)$$

$$= AB + AB'$$

$$I_m A = A \qquad m \times n$$

$$I_m A = \left(r_i(I_m)\, c_k(A) \right) =$$

$$\left(\begin{pmatrix} 0 & \cdots & \underset{i}{1} & \cdots & 0 \end{pmatrix} \cdot \begin{pmatrix} a_{1k} \\ \vdots \\ a_{mk} \end{pmatrix} \right) = (1 \cdot a_{ik})$$

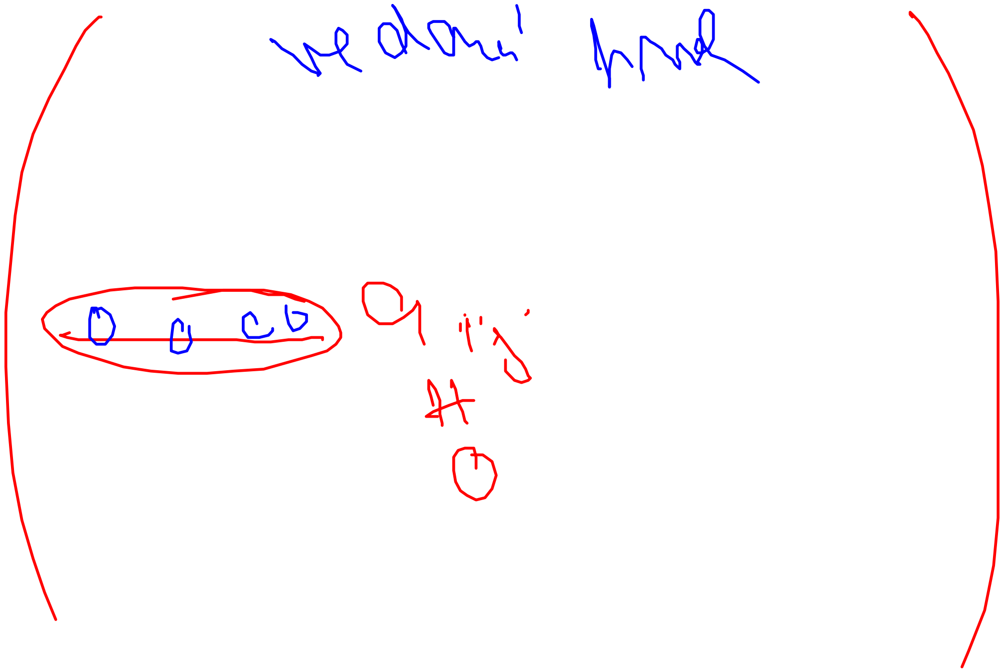
$$= (a_{ik}) = A$$

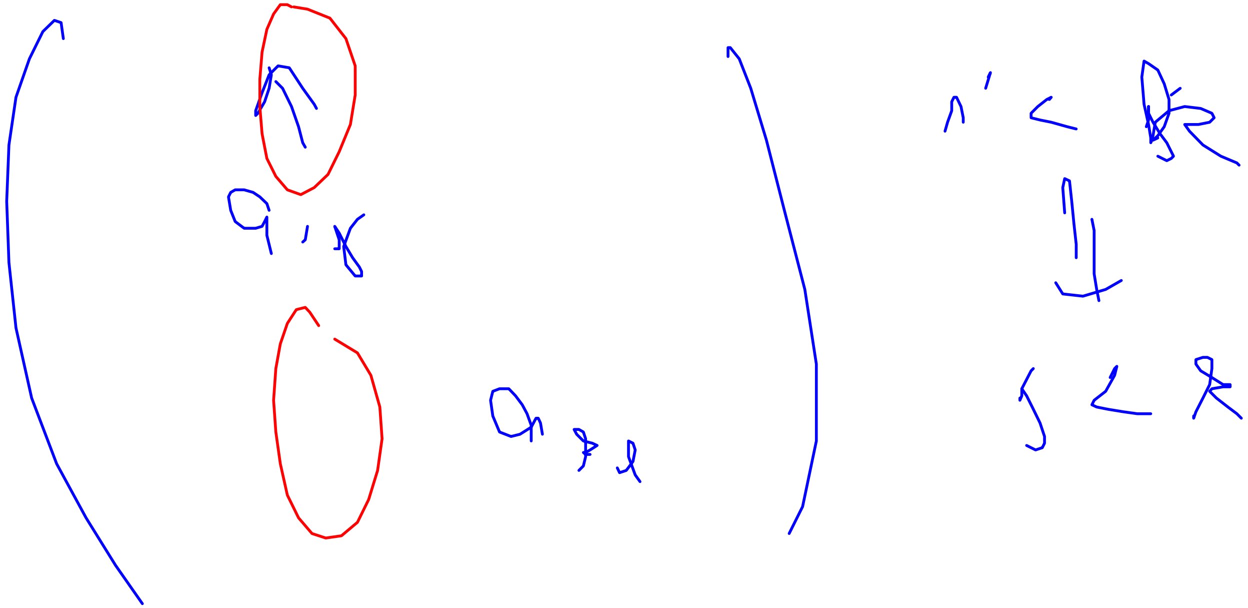
$$(A \cdot B)^T = \left(r_i(A)\, c_k(B)\right)^T$$

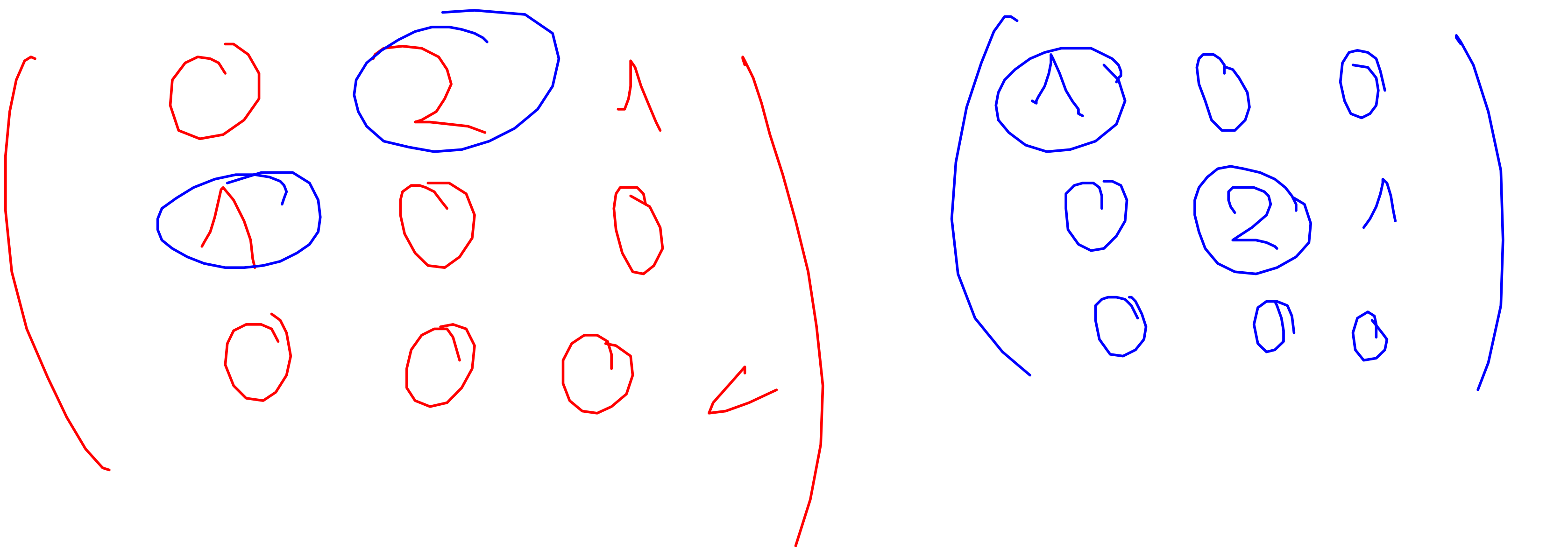
$$= {}_{k \to i}\left(r_i(A) \cdot c_k(B) \right) = {}_{k,i}\left(c_k^T(B)\, r_i^T(A) \right)$$

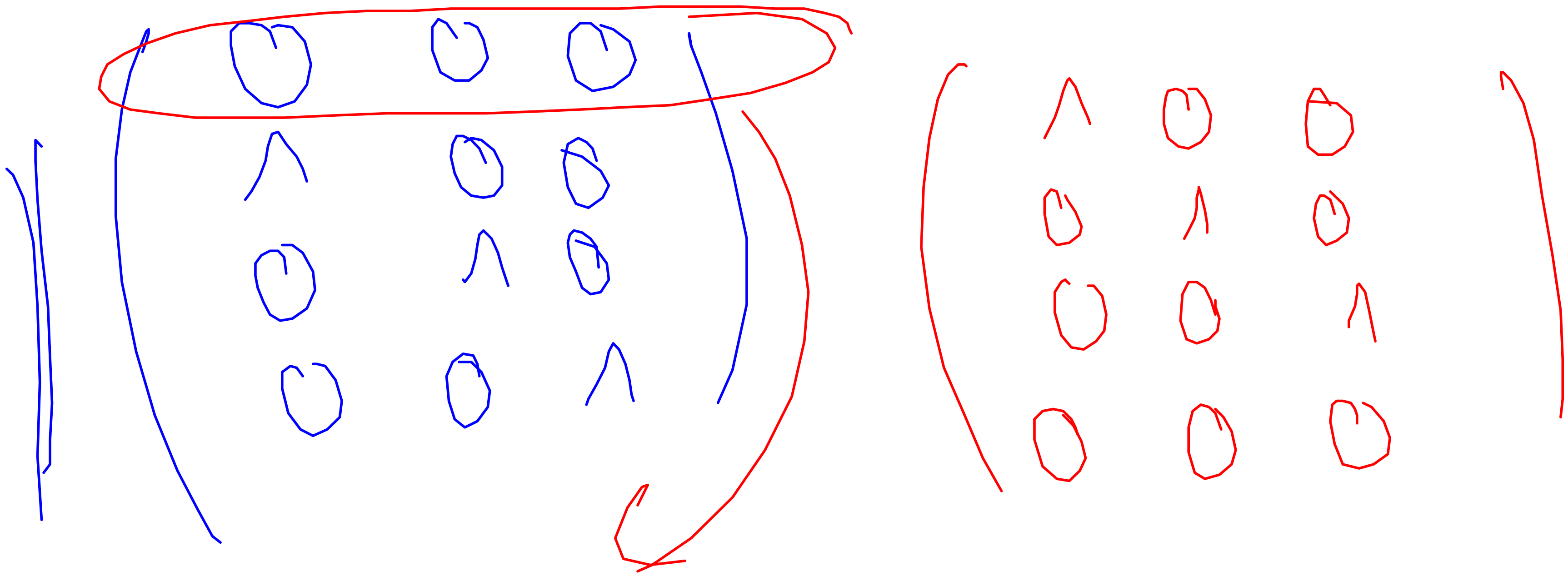
$$= \left(r_k(B^T)\, c_i(A^T) \right) =$$

$$= B^T A^T$$


we don't know







$$\begin{pmatrix} 2 & 3 & 0 & 1 \\ 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 0 \end{pmatrix} \sim \begin{pmatrix} 1 & \frac{3}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 \end{pmatrix} \sim \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\left(\begin{array}{ccccc|c} 1 & 0 & -2 & 0 & 0 & 3 \\ 0 & 1 & 6 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \end{array}\right)$$

$x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5$

$x_3 = t$

$x_5 = 0$

$a, t \in \mathbb{R}$

$x_4 = 1$

$x_2 = 0 - 6x_3$

$x_1 = 3 + 2x_3$

$(3+2t, -6t, t, 1, 0)$

$$(0, \ldots, 0 \mid 1) \leftarrow$$

$(B|c)$ mà ở dưới c B đã dạng:

$$\underbrace{0x_1 + \ldots + 0x_n}_{0} = 1$$

$$0 = 1 \implies$$

$$0 \neq 1$$

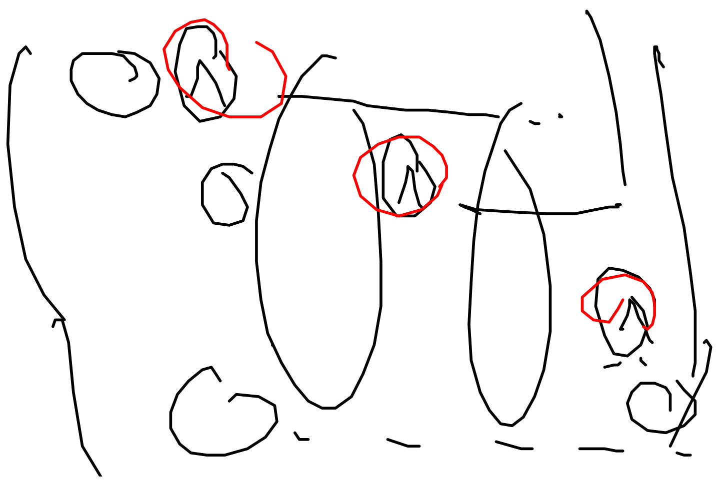
$\Leftarrow$ Pokud se v $(B|c)$ nenachází

$(0 \; \ldots \; 0 \,|\, 1)$ $\xRightarrow{2}$ $k \le m$

$Bx = c$ má řešení x_{i_1} x_{i_k}

<u>nemá řešení</u>

$x_{i_1} \; \ldots \; x_{i_k}$



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

$$\begin{array}{cccccc} x_1 & x_2 & x_3 & \rho & \lambda & \end{array}$$

$$x_3 = 4\rho + \frac{2}{5}\lambda - 2$$

$$x_2 = -\frac{3}{4}\rho + 2$$

$$x_1 = -\frac{2}{3}\rho + \frac{1}{2}\lambda + 5$$

$$\left((a_{11} \; a_{1i} \; a_{1n}) \mid (\lambda_1) \right)$$

$$\uparrow \neq 0$$

$$\left((0, 1, \ldots) \,\middle|\, \frac{\lambda_1}{a_{1i}} \right)$$

$m \geq 2$ $\qquad$ $(m-1$ $\quad$ $n) \; A'$

$$A = \left(\frac{A'}{a'} \right) \sim \left(\frac{B}{a'} \right) \sim \text{RST} \quad \text{mod } A$$

$$a' = (0 \ldots 0, \; a_{m j} \; \ldots)$$

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

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

rg 2, [illegible]

rd 3. [illegible]

$m < n$ $\quad$ $Ax = 0$ có vô số n$_o$.

$A \sim RST$

$\exists$ [illegible] $\quad$ vô số n$_o$.

0 $\quad$ x_1 tùy ý $\quad$ $x_2 = 0$

$k \neq 5$, x_k tùy ý!

$\Rightarrow$ $\exists$ vô số n$_o$

$$A = (v_1(A), \ldots \overset{j}{\ldots}, v_n(A))$$

$$Ax = 0 \qquad x_k \neq 0$$

$$k \notin \{j_1, \ldots, j_k\}$$

$$J = \{j_1, \ldots, j_k\}$$

$$(v_{j_1}(A), \ldots, v_{j_k}(A)) \begin{pmatrix} x_{j_1} \\ \vdots \\ x_{j_k} \end{pmatrix} = \underline{-v_j(A)\, x_j}$$