

$$A^t = A \Rightarrow A \text{ simetrik.}$$

$$A^t = -A \Rightarrow A \text{ ya ters-sim.}$$

$$\overline{A^t} = A \Rightarrow A \text{ ya Hermitian.}$$

$$\underbrace{[A = A^t]}$$

$$A = [a_{ij}] \Rightarrow \overline{a_{ij}} = a_{ji}$$

$$\overline{a_{ij}} = a_{ji}$$

$$\rightarrow a_{11}, a_{22}, \dots$$

$$\overline{a_{11}} = a_{11}$$

$$\overline{a_{22}} = a_{22}$$

$$\rightarrow (\overline{A} = -A^T)$$

$A, n \times n$

$\forall a.$

$$A^T = -A$$

$$\Rightarrow A^T = -A$$

Hermitian

Ex:

$$-) \quad a_{11}, a_{22}, \dots, a_{nn} \quad \overline{A} = -A^t$$

$$A = [a_{ij}]_{n \times n} \quad \overline{a_{ij}} = -a_{ji}$$

$$\overline{a_{11}} = -a_{11} \quad a_{ii} = 0$$

$$\overline{a_{22}} = -a_{22}$$

$$\left. \begin{array}{l} a_{ii} \text{ len} \\ \text{pur imaginary} \end{array} \right\}$$

$$z = \cancel{a} + ib \Rightarrow \text{pur imaginary}$$

$$\begin{aligned} \underbrace{z = ib} &\Rightarrow \bar{z} = -ib \\ &\Rightarrow -z = -ib \end{aligned}$$

Not: Tens. Hermitian m. in
 Lösen elementar sign je p
 imaginär symbolisch.

$$\begin{aligned} \bar{\bar{L}} &= -\bar{L} \rightarrow -1(-L) = L \rightarrow \bar{\bar{A}}^T = -A \end{aligned}$$

8/

$$A =$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

trans-her.

m. ?

$$\begin{aligned} & \frac{-1-i}{-2} = -\frac{1}{2} + \frac{i}{2} \rightarrow -(-1+i) = 1-i \\ & = -2 \Rightarrow \rightarrow -(-2) = 2 \end{aligned}$$

Tanım: $A, n \times n$, g.ö.a.

$$\underline{A \cdot B = B \cdot A = \underline{I_n}}$$

o.s. bir

$B, n \times n$

matrisi mevcut

ise B ye A matrisinin 'tersi

veya invers ' denir. Eğer A

m. nin tersi mevcut ise A ya

'terslenebilir' veya regüler,
m. denir.

A n -nin tersi A^{-1} ile
gösterilir. Burada A ve B
birbirinin
tersidir. Yani
 $B^{-1} = A$, $A^{-1} = B$

Eğer bir matrisin tersi mevcut
dijital ise o matrisi 'tekir'
veya 'singular' n -denir.

$$\delta / A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & -2 & 5 \\ 0 & 1 & -4 \\ 0 & 0 & 1 \end{bmatrix}$$

A ve B, birbirinin tersi olan matrisler.

Cösüm:

$$A \cdot B =$$

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

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$A^{-1} = B$$

$$B^{-1} = A$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= I_3$$

$$B A = I_3$$

$$\alpha) A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$$

mat. aın kersi yoktur.

Gösteyiniz .

$$B.A \neq I_2$$

$$C: \quad A.B \neq I_2$$

$$A.B =$$

$$\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= I_2$$

$$= \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$$

$$= I_2$$

Teorem: $n \times n$, A , matrisinin tensi
vektir (1 tane dir)

var ise

İspat: Aksini farz edelim. Yani

A n. nin iku tane tensi olsun.

A nin tensileri B ve C n. len

olsun.

$$A \text{ invertible } C \Rightarrow A \cdot C = \underline{C} \cdot A = \underline{I}$$

$$A \text{ invertible } \underline{B} \Rightarrow A \cdot B = \underline{B} \cdot A = \underline{I}$$

$$\cancel{C} = C \cdot \underline{I} = C \cdot (A \cdot B)$$

$$= (C \cdot A) \cdot B$$

$$= \underline{I} \cdot B = \underline{B}$$

$$\left. \begin{array}{l} (1) \quad x + 2y = 4 \\ (2) \quad 4x - 3y = 6 \end{array} \right\} \underline{\underline{\text{Cofactor}}}$$

$$\left. \begin{array}{l} 4x - 3y = 6 \\ x + 2y = 4 \end{array} \right\} \begin{array}{l} \text{Cofactor} \\ \text{aynıdır} \end{array}$$

$$(3) \text{ -ke } x + 2y = 4$$

$$3x - 5y = 0$$

2. ~~10.68~~

$$-3 \text{ / } x + 2y = 4$$

$$3x - 5y = 0$$



}
} $\left. \begin{array}{l} \text{ke } x + 2y = 4 \\ 3x - 5y = 0 \end{array} \right\}$ $\left. \begin{array}{l} \text{ke } x + 2y = 4 \\ 3x - 5y = 0 \end{array} \right\}$

4

$$x + 2y = 4$$

$$3x - 5y = 6$$

$$-----$$

$$9x = 6$$

$$x = \frac{2}{3}$$

$$x = \frac{2}{3}$$

Tanım: Bir matrisin satırları (veya sütunları) üzerinde yapılan; n elemanlı satır (veya n elemanlı sütun) n elemanlı işlemler aşağıda verilmiştir:

(1) Matrixin T ve J normal
setir $\log(n)$ der
setir $\log(n)$ der

(veya K_i)

(3) Matrisin $\bar{L}$ numarda satirini
(sətununu) $0 \neq \lambda$ skaleri ilə vurup $\bar{L}$ numarda
satirini eklenə $H_{\bar{L}}(n) (K_{\bar{L}}(n))$
(sətununu)

(2) Matrisin $\bar{L}$ numarda satirini
(veya sətununu) $0 \neq \lambda$ skaleri ilə
vurup $H_{\bar{L}}(n) [K_{\bar{L}}(n)]$

Bir A $m \cdot n$ e boyda i kinci
satır (veya i kinci sütun) i slemeler
uygulamak elde edilen matrislere

i denk matrisler denir.

$A \sim B$ i zelinde gösterilir.

$$\delta / A = \begin{bmatrix} 1^* & 2 & 3 \\ 0 & 5 & -1 \\ 7 & 2 & 4 \end{bmatrix}$$

dent 6it B mat.
bulalim.

$$COC \begin{matrix} 5 \\ 3 \\ 2 \end{matrix} \quad T_3 = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 7 & 17 \\ 3 & 1 & 7 \end{bmatrix} \quad N \begin{matrix} 5 \\ 1 \\ 1 \end{matrix} \quad \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 1 & 17 \\ 1 & 1 & 17 \\ 1 & 1 & 17 \end{bmatrix}$$

$$1(-7) + \underline{7} = \underline{0}$$

$$3(-7) + 4 = -17$$

$$2(-7) + 2 = -12$$

$$2 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = B$$

$$H_2(1/5)$$

$$2 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = C$$

Tanım: Bir matris aşağıdaki formda ise
1 satırca eselon formdadır 1 den if-

(1) İlk k satır sıfırdan farklı;

$(k+1)$. satır ve son sıradaki
satırların k 3ü elemanları sıfırdır

(2) Her satırda k 1 fından fazla ilk
eleman 1 1 dir ve bu 1'ler

$S_1 < S_2 < \dots < S_k$ o.ş. S_j .
sütünde bulunanlar

(3) Bir satırda S_i ’den fazla

ilk eleman $'a_{ij} = 1' \Rightarrow j$. sütunda
olan altırda $\sqrt{k}$ ’den fazla

a_{ij} ’nin altırda

elemanlar S_i ’den fazla
Bu da burala $\sqrt{k}$ ’den fazla

'Satirca eşolan formadur'
dur.

(3) Kurulunda $q_1 = 1$
in altında ve üstünde kalır

elementer z_1 z_2
'Satirca indirgenmiş eşolan form'
dur.

Beyaz tohumlar

1 sütnca ezodan

Form 1

ve

1 sütnca

indirgenmiş

ezodan

Form 1 içinde

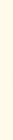
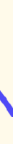
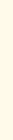
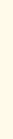
verilebilir.

$$(1) \quad \frac{1}{2} + 2 = \frac{5}{2}$$

3x-5=6

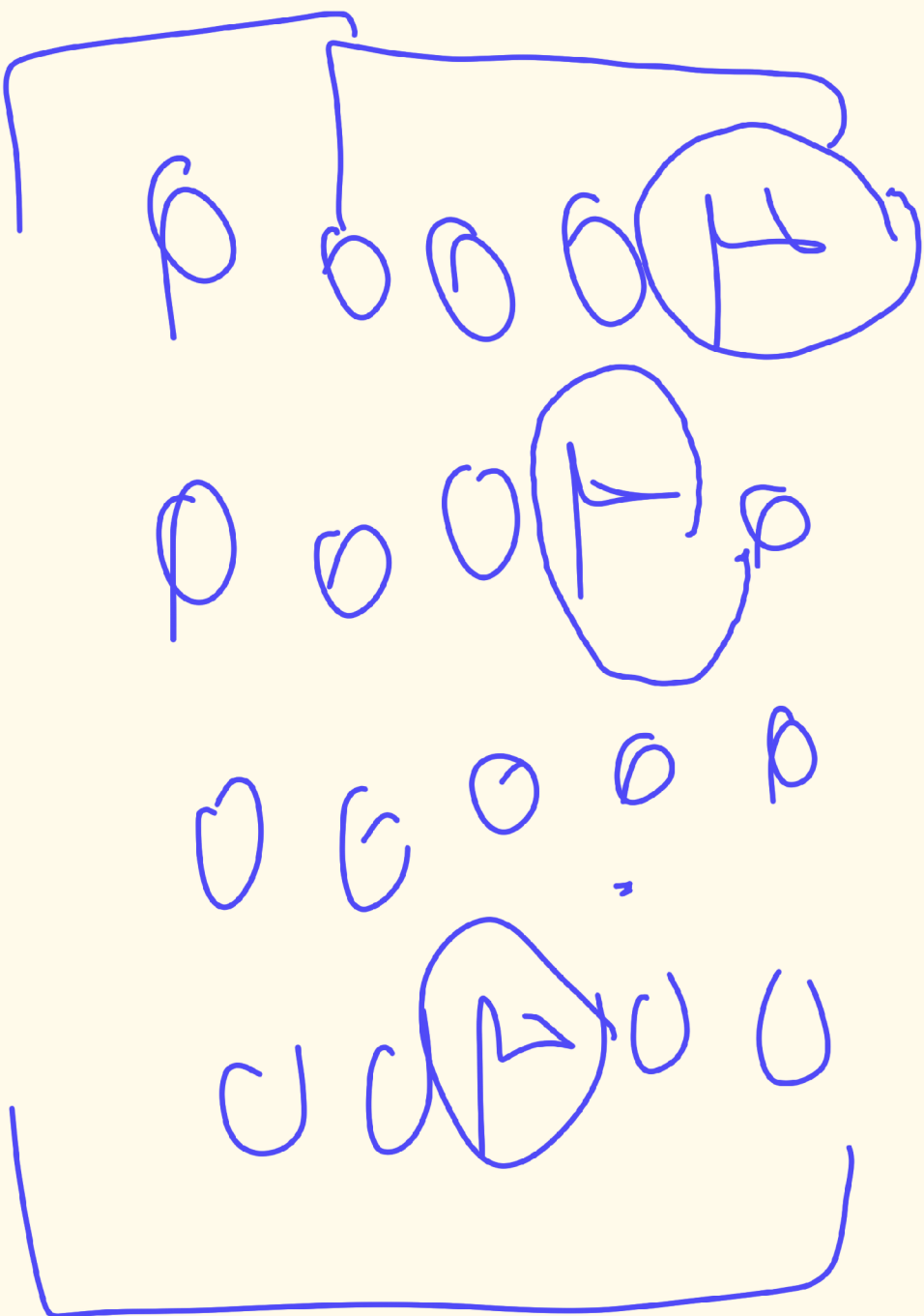
[illegible]

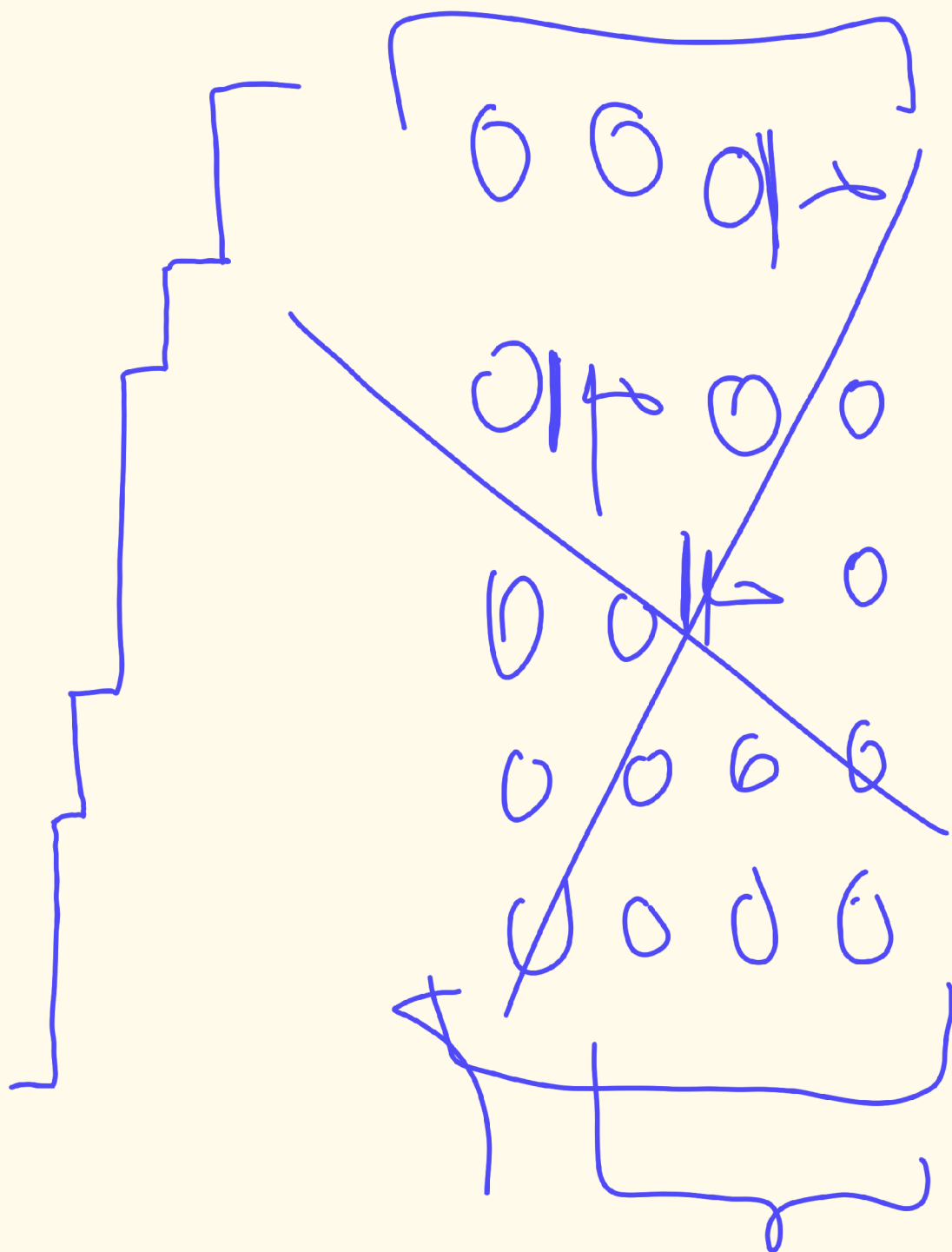
~~




~~

~~hix~~
+
~~x~~
||
~~u~~
A

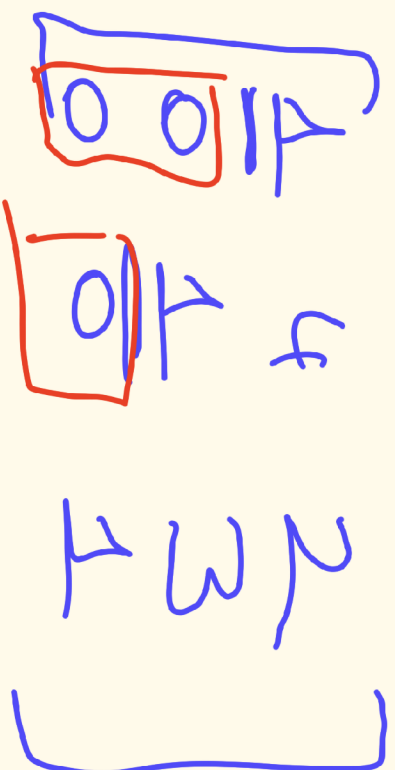
1 len sircal





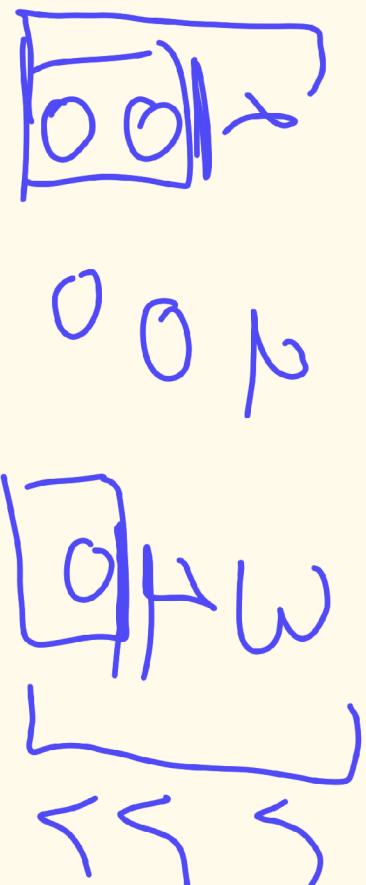
5/

A =



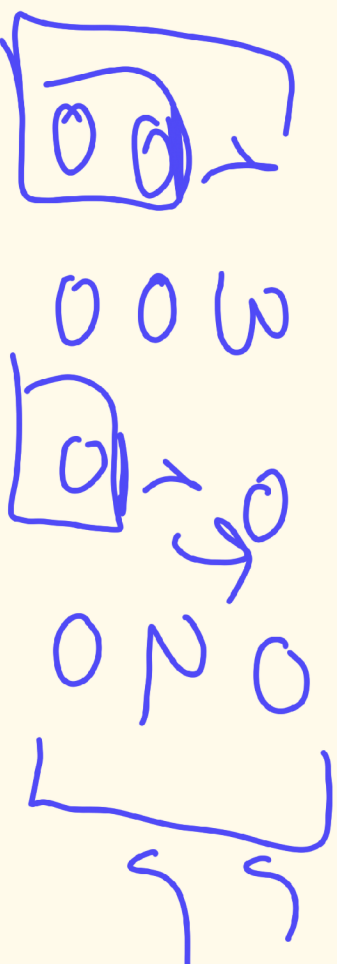
softcore
esobar fm

B =



softcore
esobar fm

C =



softcore
indipenit
esobar fm

$$D = \begin{bmatrix} 2 & 3 & 5 \\ 0 & 4 & 6 \\ 0 & 0 & 1 \end{bmatrix}$$

1 satirca ecolo bən
degildir 1

$$E = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

1 satirca ecolo bən
Pərn degildir

$$F = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

1 satirca ecolo bən
Pərn degildir.

Teorî: 'Satırca ezodan farndaki'
bir matrisin sifndan farakla satrların
sayısına o matrisin 'rang'ı denir.

$\text{rank } A$ veya $\text{rang } A$ san.
nonhang biri ile gösterilir.

$\frac{1}{Q}$

The diagram shows a horizontal line with points labeled ω , γ , δ , ϵ , and ρ . Above the line are three overlapping semi-circular arcs. The first arc connects ω and ρ . The second arc connects γ and δ . The third arc connects ϵ and ζ . Arrows indicate a sequence from left to right. A star symbol is at the end of the line.

$\omega \sim \gamma \mid \delta \mid \epsilon \mid \rho$

$\omega \mid \rho \rightarrow \gamma \rightarrow$

$\omega \mid \gamma \mid \delta \mid \epsilon$

$\circ \circ \vdash$

$\gamma \vdash \rho$

$\circ \mid \gamma \vdash$

$\gamma \mid \rho \circ$

$$\text{rank } A = 2$$

$$\text{one } A = \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 1 & 3 & 4 & 5 \\ 1 & 4 & 5 & 6 \end{pmatrix}$$

$$1(-2) + 2 = 0 \quad 2(-2) + (-1) = -5 \quad 1(-2) + 2 = 0$$

$\begin{matrix} & 1 \\ & 2 \\ & 5 \\ & 2 \end{matrix}$

$$\begin{array}{r}
 2 \\
 \hline
 0 \quad 0 \quad 0 \quad 0 \quad 0 \\
 \hline
 1 \quad 4 \quad 5 \quad 4 \quad 2 \\
 2 \quad 2 \quad 0 \quad 2 \quad 1 \\
 5 \quad 2 \quad 5 \quad 2 \quad 0 \\
 \hline
 \end{array}$$

$\begin{matrix} 1 \\ 5 \\ 4 \end{matrix} (-1)$

$$\begin{array}{r}
 22 \\
 \hline
 0 \quad 0 \quad 0 \quad 0 \quad 1 \\
 \hline
 1 \quad 4 \quad 5 \quad 4 \quad 2 \\
 2 \quad 2 \quad 0 \quad 2 \quad 1 \\
 5 \quad 2 \quad 5 \quad 2 \quad 0 \\
 \hline
 \end{array}$$

$$\begin{array}{cccc|cccc}
 1 & 2 & 1 & 0 & 1 & 2 & 1 & 0 \\
 0 & -1 & -2 & 0 & 0 & -1 & -2 & 0 \\
 0 & -4 & 2 & 0 & 0 & -4 & 2 & 0 \\
 0 & -5 & 2 & 0 & 0 & -5 & 2 & 0 \\
 0 & 0 & 2 & 0 & 0 & 0 & 2 & 0
 \end{array}$$

$$H_{54}(-1)$$

$$H_3(-1/5)$$

$$\left[\begin{array}{ccc|ccc}
 1 & 0 & 0 & 0 & 0 & 0 \\
 0 & 1 & 0 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 0 & 0 \\
 0 & 0 & 0 & 1 & 0 & 0 \\
 0 & 0 & 0 & 0 & 1 & 0 \\
 0 & 0 & 0 & 0 & 0 & 1
 \end{array} \right]$$

$$H_3(-1/5), \quad H_{32}(-1), \quad H_{42}(4)$$

$$1.(4) - 4 = 0 \quad -3(4) + 2$$

$$(-2)4 - 2 = -10$$

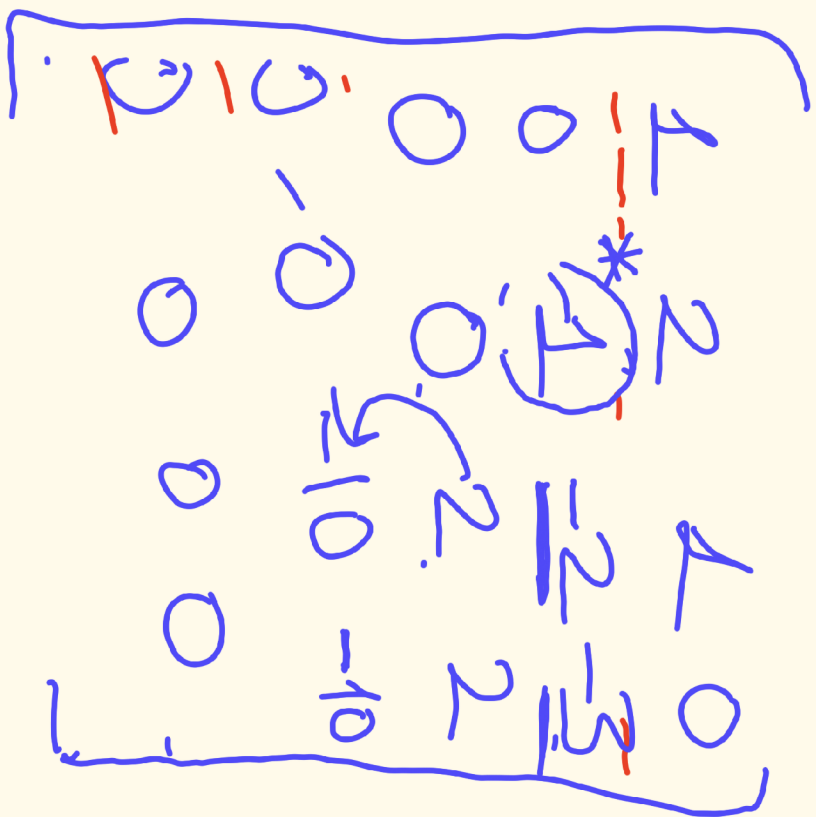
$$\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \\ \hline 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{array} \right]$$

$$H_{32}(-1)$$

$$(-2)(-1) + 0 = 2, \quad (-3)(-1) - 1$$

$$H_{42}(4)$$

$H_{43}(5)$



$$H_3(1/2)$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\text{rank } A = \underline{\underline{3}}$$

→ saturation equation form