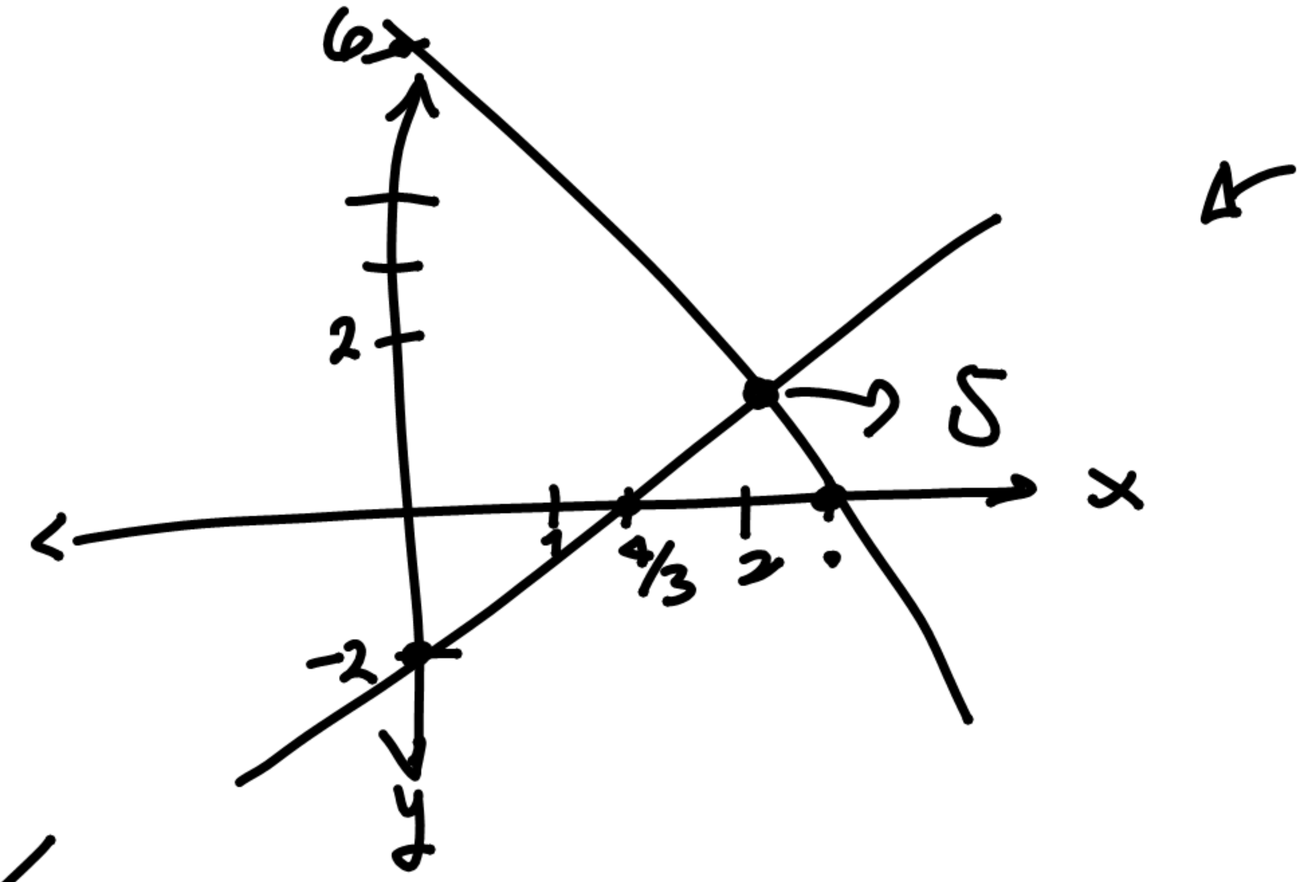
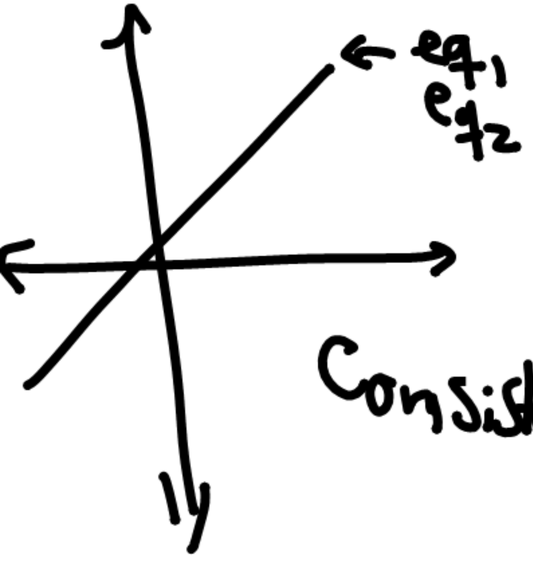
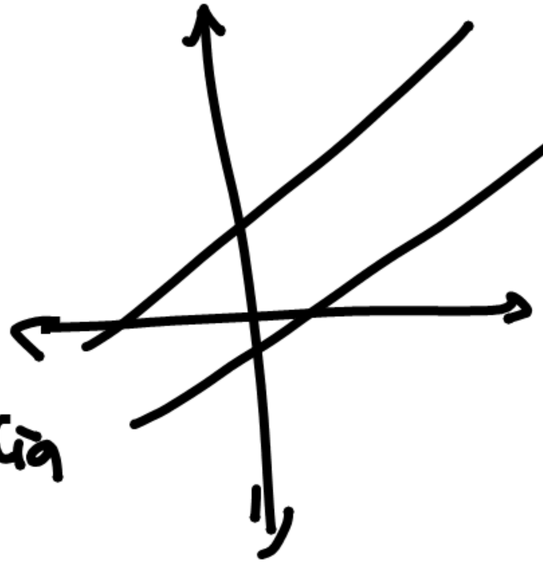
$$\underset{m\times n}{\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix}} \underset{n\times 1}{\begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}} = \begin{pmatrix} b_1 \\ b_2 \\ \vdots \\ b_m \end{pmatrix}$$

$$\underset{m\times 1}{\begin{pmatrix} a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n \\ \vdots \end{pmatrix}} = \begin{pmatrix} b_1 \\ b_2 \\ \vdots \\ b \end{pmatrix}$$

$$3x - 2y = 4$$
$$+\ 5x + 2y = 12$$
$$8x = 16$$
$$x = 2$$
$$y = 1$$







→ inconsistente

Si $a = b$, $\Rightarrow$ $a \cdot c = b \cdot c$

Si $a = b$ y $c = d$, entonces $a + c = b + d$.

$$\begin{cases} x_1 - 2x_2 + x_3 = 0 \\ 2x_2 - 8x_3 = 8 \\ -4x_1 + 5x_2 + 9x_3 = -9 \end{cases}$$

$$\begin{pmatrix} 1 & -2 & 1 \\ 0 & 2 & -8 \\ -4 & 5 & 9 \end{pmatrix} = A$$

$$b = \begin{pmatrix} 0 \\ 8 \\ -9 \end{pmatrix} \qquad X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

$(4) \cdot (x_1 - 2x_2 + x_3 = 0)$

$+ \; (-4x_1 + 5x_2 + 9x_3 = -9)$

$$-3x_2 + 13x_3 = -9$$

$$\begin{pmatrix} 1 & -2 & 1 \\ 0 & 2 & -8 \\ -4 & 5 & 9 \end{pmatrix} X = \begin{pmatrix} 0 \\ 8 \\ -9 \end{pmatrix}$$

A A b b

$$\left(\begin{array}{ccc|c} 1 & -2 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ -4 & 5 & 9 & -9 \end{array}\right) \quad (4)\cdot \quad \oplus$$

$R_3 \rightarrow 4R_1 + R_3$

$$\left(\begin{array}{ccc|c} 1 & -2 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ 0 & -3 & 13 & -9 \end{array}\right)$$

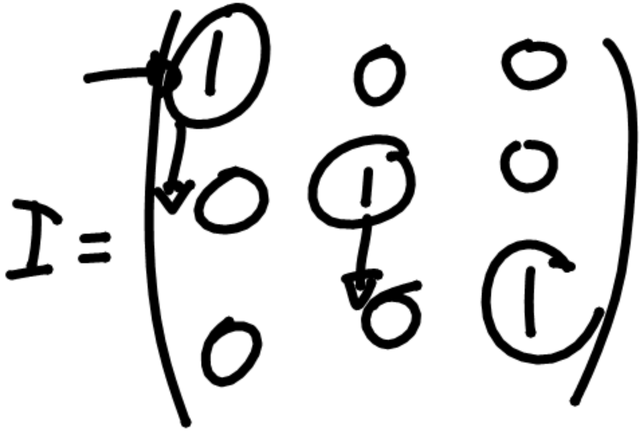
$x_1 \quad x_2 \quad x_3$

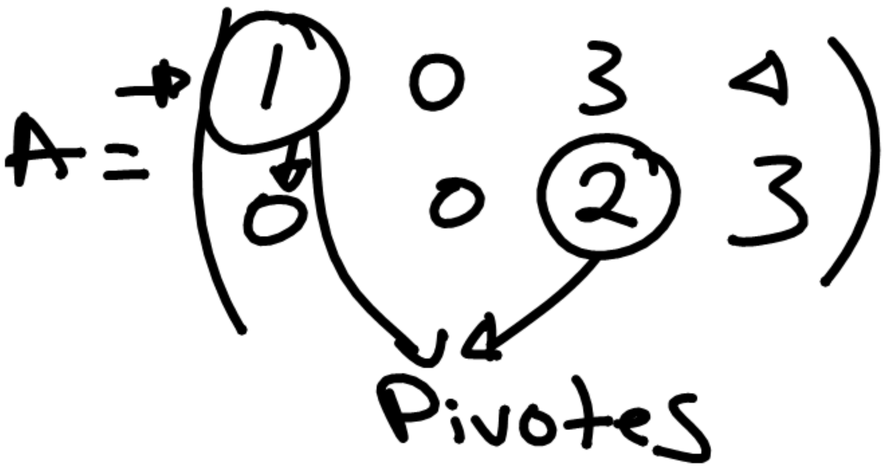
$$x_1 - 2x_2 + x_3 = 0$$

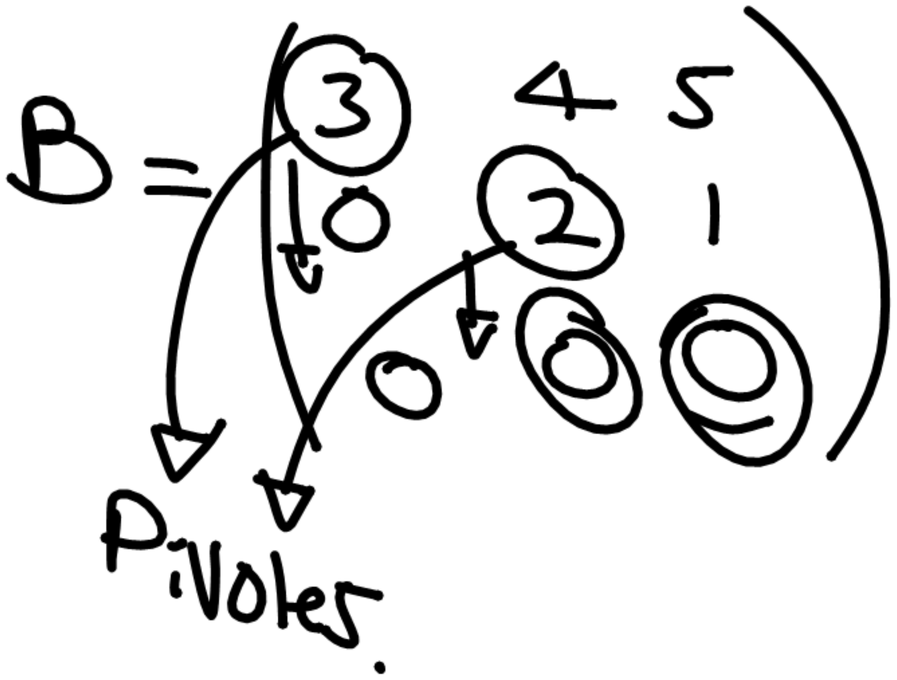
$$x_2 - 4x_3 = 4$$

$$x_3 = 3$$

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


I =
1 0 0
0 1 0
0 0 1


A =
1 0 3 4
0 0 2 3
Pivotes


B =
3 4 5
0 2 1
0 0 0
Pivotes.

$$\begin{pmatrix} 1 & 0 & 2 & 10 \\ 0 & 1 & 1 & 5 \\ 0 & 0 & 2 & 4 \end{pmatrix} \rightarrow$$

$$x_2 + x_3 = 5$$

$$x_2 = 5 - x_3$$

$$x_3 = \frac{4}{2} = 2$$

$$x_2 = \frac{1}{1}(5 - 2) = 3$$

$$x_1 + 3x_2 - 5x_3 + x_4 = 4$$
$$2x_1 + 5x_2 - 2x_3 + 4x_4 = 6$$

$$\left(\begin{array}{cccc|c} 1 & 3 & -5 & 1 & 4 \\ 2 & 5 & -2 & 4 & 6 \end{array}\right) \xrightarrow{R_2 \leftarrow R_2 - 2R_1} \left(\begin{array}{cccc|c} \underline{1} & 3 & -5 & 1 & 4 \\ 0 & \underline{-1} & 8 & 2 & -2 \end{array}\right)$$

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

$0x_1 - x_2 + 8x_3 + 2x_4 = -2$

Bas.

$-x_2 = -2 - 8x_3 - 2x_4$

$x_2 = 2 + 8x_3 + 2x_4$

$x_1 + 3(2 + 8x_3 + 2x_4) - 5x_3 + x_4 = 4$

$x_1 + 6 + 19x_3 + 7x_4 = 4$

$x_1 = -2 - 19x_3 - 7x_4$

Bas.

$$\left(\begin{array}{ccc|c} x_1 & x_2 & x_3 & \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 3 \end{array}\right) \rightarrow \begin{array}{l} x_1 = 1 \\ x_2 = 2 \\ 0x_1 + 0x_2 + 0x_3 = 3 \\ 0 = 3 \\ 0 \end{array}$$

$$\left(\begin{array}{ccc|c} 1 & 2 & 0 & 5 \\ 0 & 1 & 3 & 4 \\ 0 & 0 & 5 & 0 \end{array}\right) \rightarrow \begin{array}{l} x_1 + 2x_2 = 5 \\ x_2 + 3x_3 = 4 \\ 5x_3 = 0 \\ x_3 = 0 \end{array}$$

1) $3x_1 + 6x_2 - 6x_3 = 9$

$2x_1 - 5x_2 + 4x_3 = 6$

$5x_1 + 28x_2 - 26x_3 = -8$

I.

2) $x_1 + 2x_2 - 2x_3 - x_4 = 1$

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

$-3x_1 + 14x_2 + 4x_3 - 7x_4 = 3$

$6x_1 + 12x - 12x_3 - 6x_4 = 5$

I.

3) $x_1 + x_2 - x_3 = 0$

$4x_1 - x_2 + 5x_3 = 0$ Cons

$6x_1 + x_2 + 3x_3 = 0.$

Soluciones infinitas.

$x_3 \rightarrow$ libre

$x_1 = -4/5\, x_3$

$x_2 = 9/5\, x_3$

$\rightarrow V_1, V_2, V_3 \in \mathbb{R}^3$

$$\alpha_1 V_1 + \alpha_2 V_2 + \alpha_3 V_3 = 0$$

- I.L.
  A- es único
- L.D.
  A- No es único.

$$V_1 \alpha_1 + V_2 \alpha_2 + V_3 \alpha_3 = 0$$

$$\begin{pmatrix} V_1 & V_2 & V_3 \end{pmatrix} \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{pmatrix} = 0$$

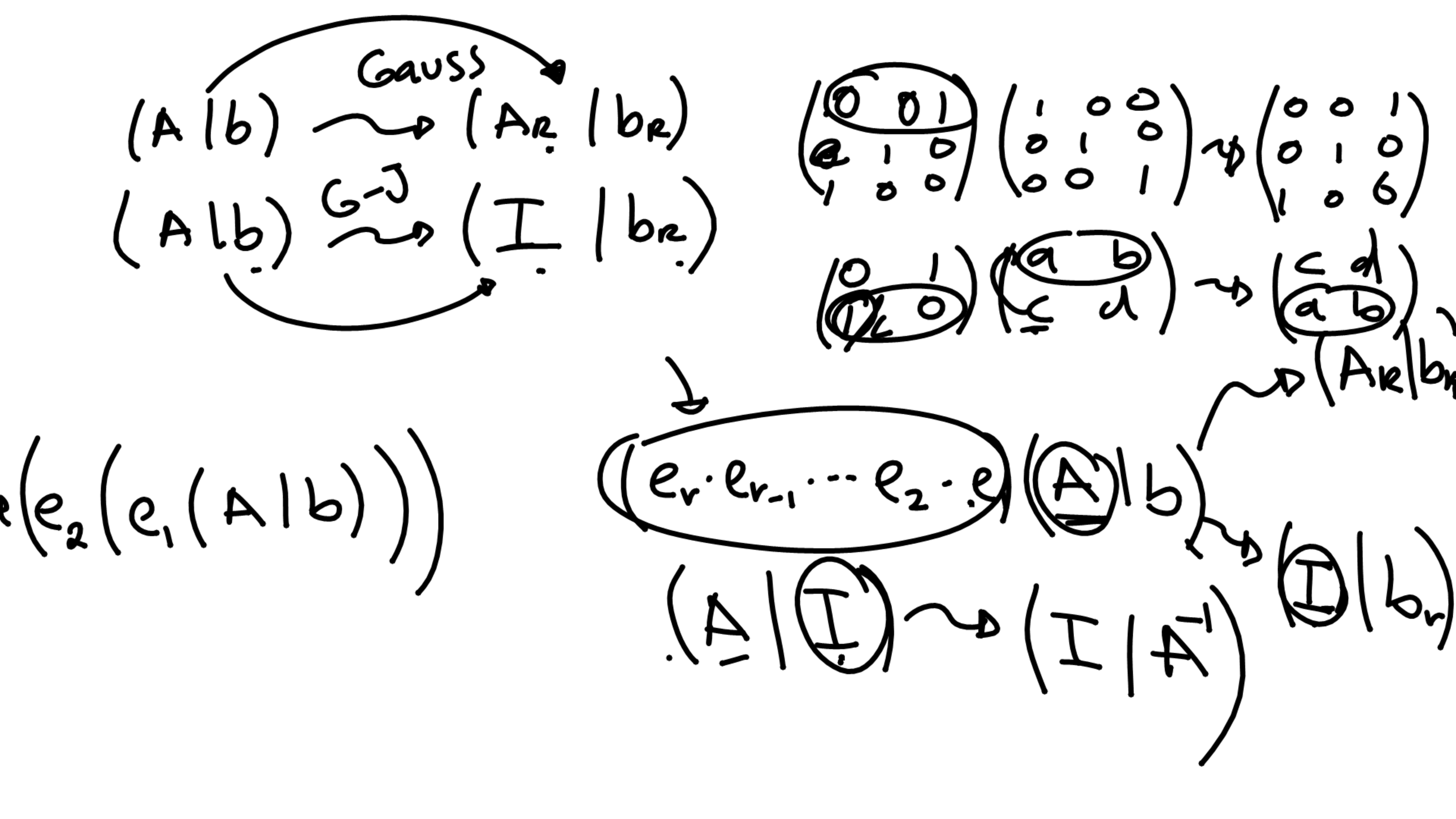
$$3x - 2y = 4$$
$$5x + 2y = 12$$

$$\left(\begin{array}{cc|c} 3 & -2 & 4 \\ 5 & 2 & 12 \end{array}\right) \xrightarrow{R_1 \to R_1 + R_2} \left(\begin{array}{cc|c} 8 & 0 & 16 \\ 5 & 2 & 12 \end{array}\right)$$

$$\xrightarrow{\begin{array}{l} R_1 \to \frac{1}{8} R_1 \\ R_2 \to -\frac{5}{8} R_1 + R_2 \end{array}} \left(\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 2 & 2 \end{array}\right)$$

$$\begin{pmatrix} 3 & -2 \\ 5 & 2 \end{pmatrix} \rightsquigarrow \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 3 & -2 \\ 5 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 1/3 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 3 & -2 \\ 5 & 2 \end{pmatrix} = \begin{pmatrix} 1 & -2/3 \\ 5 & 2 \end{pmatrix}$$


Gauss
(A|b) ⇝ (A_R|b_R)
(A|b) G-J ⇝ (I|b_R)
e(e_2(e_1(A|b)))
(e_r · e_{r-1} ··· e_2 · e_1)(A|b)
(A|I) ⇝ (I|A^{-1})
(A|b) ⇝ (A_R|b_R)
(A|b) ⇝ (I|b_R)

$X_1 \rightarrow$ Cant. peces esp. 1

$X_2 \rightarrow$ " " " 2

$X_3 \rightarrow$ " " " 3

$$1x_1 + 3x_2 + 2x_3 = 25{,}000$$

$$1x_1 + 4x_2 + 1x_3 = 20{,}000$$

$$2x_1 + 5x_2 + 5x_3 = 55{,}000$$

$$\begin{pmatrix} 1 & 0 & 5 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 40\,000 \\ -5000 \\ 0 \end{pmatrix} \rightsquigarrow$$

$x_1 + 5x_3 = 40000 \rightsquigarrow x_1 = 40000 - 5x_3$

$x_2 - x_3 = -5000 \rightsquigarrow x_2 = -5000 + x_3$

$x_1 \geq 0$

$x_2 \geq 0$

$40000 - 5x_3 \geq 0$

$8000 \geq x_3$

$x_3 \geq 5000$

$$5000 \leq x_3 \leq 8000$$