

$$(c) \begin{cases} x - y + z = 2 \\ -x + 2y + z = -1 \\ -x + 4y + 5z = 2 \end{cases}$$

1) igualo la ecuación 1 y 2 eliminando x

$$(x - y + z) + (-x + 2y + z) = 2 + (-1)$$

$$-y + z + 2y + z = 1$$

$$y + 2z = 1$$

2) Reescribir la ecuación

$$\begin{cases} x - y + z = 2 \\ y + 2z = -1 \\ -x + 4y + 5z = 2 \end{cases}$$

3) igualo 1 y 3 borrando x

$$(x - y + z) + (-x + 4y + 5z) = 2 + 2$$

$$-y + z + 4y + 5z = 4$$

$$3y + 6z = 4$$

3) Reescribo la ecuación 4) igualo 2 y 3

$$\begin{cases} -x + y + z = 2 \\ y + 2z = -1 \\ 3y + 6z = 4 \end{cases}$$

$$\rightarrow -3(y + 2z) + (3y + 6z) = -1 + 4$$

$$-3y + 3y + 6z - 6z = 3$$

Sistema inconsistente

$$(d) \begin{cases} x - y + 2z = -3 \\ 4x + 4y - 2z = 1 \\ -2x + 2y - 4z = 6 \end{cases}$$

1) igualo la ecuación 2 y 3

$$(4x + 4y - 2z) + 2(-2x + 2y - 4z) = 6 \cdot 2 + 1$$

$$4x - 2z + 4y - 8z = 13$$

$$+ 8y - 10z = 13$$

2) Reescribo la ecuación

$$\begin{cases} 8y - 10z = 13 \\ 4x + 4y - 2z = 1 \\ -2x + 2y - 4z = 6 \end{cases}$$

3) igualo 2 y 3 eliminando x

$$2(-2x + 2y - 4z) + (4x + 4y - 2z) = 12 + 1$$

$$-4x + 4y - 8z + 4x + 4y - 2z = 13$$

$$4y - 8z + 4y - 2z = 13$$

$$8y - 10z = 13$$

¿que pasa?

quedo

$$\begin{cases} 8y - 10z = 13 \\ 8y - 10z = 13 \\ -2x + 2y - 4z = 6 \end{cases}$$

Pasado a matrices:

i, j → File Column

$$A = \left[\begin{array}{ccc|c} 1 & 0 & 3 & 1 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 3 & 3 \end{array} \right] \begin{array}{l} F_1 \\ F_2 \\ F_3 \end{array}$$

Intentamos conseguir algo de o1o

$$\begin{array}{l} \xrightarrow{F_3} \\ F_3 \rightarrow F_3:3 \end{array} \quad A = \left[\begin{array}{cccc|c} 1 & 0 & 3 & 1 & 0 \\ 0 & 1 & 1 & 2 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{array} \right] \begin{array}{l} \xrightarrow{F_1} \\ F_1 \rightarrow F_1 - F_3 \end{array} \quad A = \left[\begin{array}{cccc|c} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & 1 & 2 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{array} \right]$$

$$F_2 \xrightarrow{F_2 \rightarrow F_2 - F_3} A = \left[\begin{array}{cccc|c} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{array} \right] \xrightarrow{F_1 \rightarrow F_1 - 2F_3} A = \left[\begin{array}{cccc|c} 1 & 0 & 0 & -2 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{array} \right]$$

• Como se concluye una matriz?

$$(b) \begin{cases} x + y - 2z = 0 \\ 3x + 4y - 8z = 0 \end{cases}$$

1) igualo las ecuaciones

$$-3(x+y-2z) + (3x+4y-8z) = 0$$

$$-3x - 3y + 6z + 3x + 4y - 8z = 0$$

$$y - 2z = 0$$

2) Reescribo

$$\begin{cases} x+y-2z=0 \\ y-2z=0 \end{cases}$$

$$\rightarrow x + 2z - 2z = 0 \rightarrow x = 0$$

$$\rightarrow Y = ZZ \quad Z = Z$$

$$(c) \begin{cases} x + y + z = 0 \\ -x - 2y + 3z = 0 \\ x + 4y + 9z = 0 \end{cases}$$

Hogamos

→

1) igualo 1 y 2

$$x + y + z + (-x) - 2y + 3z = 0$$

$$+y + z - 2y + 3z = 0$$

$$-y + 4z = 0$$

2) Reescribo

$$\begin{cases} -y + 4z = 0 \\ -x - 2y + 3z = 0 \\ x + 4y + 9z = 0 \end{cases}$$

3) igualo 2 y 3

$$(-x - 2y + 3z) + (x + 4y + 9z) = 0$$

$$2y + 12z = 0$$

4) Reescribir

5)

$$\begin{cases} -y + 4z = 0 \\ -x - 2y + 3z = 0 \\ 2y + 12z = 0 \end{cases}$$

$$y = -4z$$

$$-4z = -6z$$

$$y = -6z$$

$$0 = -2z$$

$$0 = z$$

$$z = 0 \quad y = 0 \quad x = 0$$

$$x \Rightarrow -x - 2(0) + 3(0) = 0$$

$$-x = 0$$

$$x = 0$$

$$(d) \begin{cases} x_1 + x_2 - x_4 = 0 \\ 2x_1 + 3x_2 - x_3 - x_4 = 0 \\ 5x_1 + 7x_2 - 2x_3 - 3x_4 = 0 \\ x_1 + 2x_2 - x_3 = 0 \end{cases}$$

$$D = \left[\begin{array}{cccc|c} 1 & 1 & 0 & -1 & 0 \\ 2 & 3 & -1 & -1 & 0 \\ 5 & 7 & -2 & -3 & 0 \\ 1 & 2 & -1 & 0 & 0 \end{array} \right]$$

$$\xrightarrow[F_2 \rightarrow F_2 - 2F_1]{F_2}$$

$$D = \left[\begin{array}{cccc|c} 1 & 1 & 0 & -1 & 0 \\ 0 & 1 & -1 & 1 & 0 \\ 5 & 7 & -2 & -3 & 0 \\ 1 & 2 & -1 & 0 & 0 \end{array} \right]$$

$$\xrightarrow[F_3 \rightarrow F_3 - 5F_1]{F_3}$$

$$D = \left[\begin{array}{cccc|c} 1 & 1 & 0 & -1 & 0 \\ 0 & 1 & -1 & 1 & 0 \\ 0 & 2 & -2 & 2 & 0 \\ 1 & 2 & -1 & 0 & 0 \end{array} \right]$$

$$\xrightarrow[F_4 \rightarrow F_4 - F_1]{F_4}$$

$$D = \left[\begin{array}{cccc|c} 1 & 1 & 0 & -1 & 0 \\ 0 & 1 & -1 & 1 & 0 \\ 0 & 2 & -2 & 2 & 0 \\ 0 & 1 & -1 & -1 & 0 \end{array} \right]$$

$$\begin{array}{l} F_3 \rightarrow F_3 - 2F_2 \\ F_3 \rightarrow F_3 - 2F_2 \end{array} \rightarrow D \left[\begin{array}{cccc|c} 1 & 1 & 0 & -1 & 0 \\ 0 & 1 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & -1 & -1 & 0 \end{array} \right] \xrightarrow{\substack{F_4 \rightarrow F_4 - F_2 \\ F_4 \rightarrow F_4 - F_2}} D \left[\begin{array}{cccc|c} 1 & 1 & 0 & -1 & 0 \\ 0 & 1 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right] -$$

$$(e) \begin{cases} x_1 + 2x_2 + x_3 - x_4 = 2 \\ 3x_1 + x_2 - x_3 - x_4 = 7 \\ 5x_1 - 3x_3 - x_4 = 5 \end{cases}$$

$$e = \left[\begin{array}{cccc|c} 1 & 2 & 1 & -1 & 2 \\ 3 & 1 & -1 & -1 & 7 \\ 5 & 0 & -3 & -1 & 5 \end{array} \right] \xrightarrow{\substack{F_3 \rightarrow F_3 - 2F_2 \\ F_3 \rightarrow F_3 - 2F_2}} e = \left[\begin{array}{cccc|c} 1 & 2 & 1 & -1 & 2 \\ 3 & 1 & -1 & -1 & 7 \\ -1 & -2 & -1 & 1 & -9 \end{array} \right]$$

$$\xrightarrow{\substack{F_3 \rightarrow F_3 + F_1 \\ F_3 \rightarrow F_3 + F_1}} \left[\begin{array}{cccc|c} 1 & 2 & 1 & -1 & 2 \\ 3 & 1 & -1 & -1 & 7 \\ 0 & 0 & 0 & 0 & -7 \end{array} \right] \text{ inconsistente}$$

$$(f) \begin{cases} x + 2y = 15 \\ 2x + 4y = -5 \end{cases}$$

$$\begin{aligned} &\rightarrow x = 15 - 2y \\ &\rightarrow 2(15 - 2y) + 4y = -5 \\ &\quad 30 - 4y + 4y = -5 \\ &\quad 30 = -5 \quad \text{incor} \end{aligned}$$

tmb si h2go

$$2(x + 2y) = 15$$

$$2x + 4y = 30$$

is usando y q usando:

$$\begin{cases} 2x + 4y = 30 \\ 2x + 4y = -5 \end{cases}$$

$$(g) \begin{cases} 2x - y + z = 1 \\ 3x + 2y - 4z = 4 \\ -6x + 3y - 3z = 2 \end{cases}$$

1) O Per 0 2 y 3

$$(2(3x + 2y - 4z)) + (-6x + 3y - 3z) = 4 \cdot 2 + 2$$

$$6x + 4y - 8z - 6x + 3y - 3z = 10$$

$$7y - 11z = 10$$

2) Rescribo

$$\begin{cases} 2x - y + z = 1 \\ 3x + 2y - 4z = 4 \\ 7y - 11z = 10 \end{cases}$$

3) O Per 1 y 3

$$-3(2x - y + z) + 2(3x + 2y - 4z) = 1 \cdot (-3) + 4 \cdot 2$$

$$-6x + 3y - 3z + 6x + 4y - 8z = 5$$

$$7y - 11z = 5$$

4) Rescribo

$$\begin{cases} 2x - y + z = 1 \\ 7y - 11z = 5 \\ 7y - 11z = 10 \end{cases}$$

5) Despejo

inconsistente

$$(h) \begin{cases} x_1 + x_2 - x_4 = 1 \\ 2x_1 + 3x_2 - x_3 - x_4 = 3 \\ 5x_1 + 7x_2 - 2x_3 - 3x_4 = 7 \\ x_1 + 2x_2 - x_3 = 2 \end{cases}$$

$$H = \begin{bmatrix} 1 & 1 & 0 & -1 & 1 \\ 2 & 3 & -1 & -1 & 3 \\ 5 & 7 & -2 & -3 & 7 \\ 1 & 2 & -1 & 0 & 2 \end{bmatrix}$$

$F_3 \rightarrow F_3 - 2F_1$

$$H = \begin{bmatrix} 1 & 1 & 0 & -1 & 1 \\ 2 & 3 & -1 & -1 & 3 \\ 1 & 1 & 0 & -1 & 1 \\ 1 & 2 & -1 & 0 & 2 \end{bmatrix}$$

$$\xrightarrow{F_2 \rightarrow F_2 - 2F_1} H = \begin{bmatrix} 1 & 1 & 0 & -1 & 1 \\ 0 & 1 & -1 & 1 & 1 \\ 1 & 1 & 0 & -1 & 1 \\ 1 & 2 & -1 & 0 & 2 \end{bmatrix}$$

$F_3 \rightarrow F_3 - F_1$

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

$$F_4 \rightarrow F_4 - F_1$$

$$H = \left[\begin{array}{cccc|c} 1 & 1 & 0 & -1 & 1 \\ 0 & 1 & -1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & -1 & 1 & 1 \end{array} \right]$$

$F_2 / F_2 \text{ Conclure.}$

$$(b) \begin{cases} x_1 + x_2 + x_3 - x_4 = 2 \\ x_1 + 6x_2 - 2x_3 - 7x_4 = 8 \\ 2x_1 + 2x_2 - 3x_3 - 3x_4 = 5 \\ x_1 + 7x_2 - 10x_3 + 2x_4 = 7 \end{cases}$$

$\text{en } \mathbb{Z}_{11} \quad (\text{mod } 11)$

$$B = \left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ 1 & 6 & -2 & -7 & 8 \\ 2 & 2 & -3 & -3 & 5 \\ 1 & -7 & -10 & 2 & -7 \end{array} \right] \xrightarrow[F_1, F_2]{\begin{array}{l} -7 \equiv 4(11) \\ -10 \equiv 1(11) \end{array}} \left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ 1 & 6 & -2 & 4 & 8 \\ 2 & 2 & -3 & -3 & 5 \\ 1 & -7 & 1 & 2 & -7 \end{array} \right]$$

$$F_4 \rightarrow F_4 - F_2$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ 1 & 6 & -2 & 4 & 8 \\ 2 & 2 & -3 & -3 & 5 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right] \xrightarrow[F_2 \rightarrow F_2 - F_3]{F_2}$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ -1 & 4 & 1 & -7 & 3 \\ 2 & 2 & -3 & -3 & 5 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right]$$

$$F_3 \rightarrow F_3 - F_4$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ -1 & 4 & 1 & -7 & 3 \\ 2 & 1 & -6 & -1 & 6 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right] \xrightarrow[-6 \equiv 5(11)]{} \left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ -1 & 4 & 1 & -7 & 3 \\ 2 & 1 & 5 & -1 & 6 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right]$$

$$F_3 \rightarrow F_3 - 2F_1$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ -1 & 4 & 1 & -7 & 3 \\ 0 & -1 & 3 & -3 & 2 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right] \xrightarrow[F_3 \rightarrow F_3 - F_4]{F_3}$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ -1 & 4 & 1 & -7 & 3 \\ 0 & -2 & 0 & -1 & 2 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right]$$

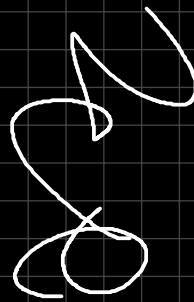
$$F_2 \rightarrow F_2 - 2F_3$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ -1 & 0 & 1 & 5 & -1 \\ 0 & -2 & 0 & -1 & 2 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right] \xrightarrow[F_2 \rightarrow F_2 + 2F_3]{F_2}$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & -1 & 2 \\ -1 & 2 & 1 & 1 & -3 \\ 0 & -2 & 0 & -1 & 2 \\ 0 & 1 & +3 & -2 & -1 \end{array} \right]$$



$$\begin{bmatrix} 1 & 1 & 1 & -1 & 2 \\ -1 & 2 & 7 & 1 & -3 \\ 0 & -2 & 0 & -1 & 2 \\ 0 & 1 & +3 & -2 & -1 \end{bmatrix}$$



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