# Ejercicios Aportaciones

## 1. Evaluar el determinante

a) $\begin{pmatrix} 4 & 3 & 2 \\ 2 & 2 & 1 \\ 1 & 1 & 3 \end{pmatrix} = \begin{pmatrix} 4 & 3 & 2 \\ 2 & 2 & 1 \\ 1 & 1 & 3 \\ 4 & 3 & 2 \\ 2 & 2 & 1 \end{pmatrix} = (24 + 4 + 3 + 18) - (4 + 18 + 4 + 9 + 6)$

$= 39 - 36 = 3$ //

## 2. Evaluar el determinante.

a) $\begin{pmatrix} 5 & 4 \\ 3 & 2 \end{pmatrix} = 10 - 12 = -2$ //

b) $\begin{pmatrix} 4 & 10 \\ 7 & 9 \end{pmatrix} = 36 - 70 = -34$ //

c) $\begin{pmatrix} 7 & 3 \\ 2 & 1 \end{pmatrix} = 7 + 6 = 13$ //

d) $\begin{pmatrix} -7 & 4 \\ 2 & 7 \end{pmatrix} = -49 - 8 = -57$ //

e) $\begin{pmatrix} -7 & 2 \\ 1 & 0 \end{pmatrix} = 0 + 2 = -2$ //

f) $\begin{pmatrix} -7 & 9 \\ 8 & 1 \end{pmatrix} = -7 - 72 = -79$ //

g) $\begin{pmatrix} 7 & 6 \\ 5 & 4 \end{pmatrix} = 28 - 30 = -2$ //

h) $\begin{pmatrix} -2 & 1 \\ -1 & 3 \end{pmatrix} = -6 + 1 = -5$ //

i) $\begin{pmatrix} 4 & 5 \\ 7 & 2 \end{pmatrix} = 8 - 35 = -27$ //

j) $\begin{pmatrix} -7 & 2 \\ 1 & 0 \end{pmatrix} = 0 - 2 = -2$ //

## 3. Determinar los siguientes valores $V_1, V_2, V_3$ con el uso de una calculadora.

a) $5V_1 + 3V_2 - 2V_3 = 0$
$7V_1 + 2V_1 + 7V_3 = 0$
$9V_1 + 4V_2 + 5V_3 = 0$

$V_1 = 0$ V

$V_2 = 0$ V

$V_3 = 0$ V

Transformar la matriz aumentada del sistema em uma matriz en forma escalonada:

$$\left(\begin{array}{ccc|c} 5 & 3 & -2 & 0 \\ 7 & 2 & 7 & 0 \\ 9 & 4 & 5 & 0 \end{array}\right) \times\left(\frac{1}{5}\right) \overset{?}{\sim} F_1/(5) \to F_1 \left(\begin{array}{ccc|c} 1 & \frac{3}{5} & \frac{-2}{5} & 0 \\ 7 & 2 & 7 & 0 \\ 9 & 4 & 5 & 0 \end{array}\right) \times(-7) \overset{?}{\sim} F_2 - 7\cdot F_1 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{3}{5} & \frac{-2}{5} & 0 \\ 0 & \frac{-11}{5} & \frac{49}{5} & 0 \\ 9 & 4 & 5 & 0 \end{array}\right) \times(-9) \overset{?}{\sim} F_3 - 9\cdot F_1 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{3}{5} & \frac{-2}{5} & 0 \\ 0 & \frac{-11}{5} & \frac{49}{5} & 0 \\ 0 & \frac{-7}{5} & \frac{43}{5} & 0 \end{array}\right) \times\left(\frac{-5}{11}\right) \overset{?}{\sim} F_2/\left(\frac{-11}{5}\right) \to F_2$$

$$\left(\begin{array}{ccc|c} 1 & \frac{3}{5} & \frac{-2}{5} & 0 \\ 0 & 1 & \frac{-49}{11} & 0 \\ 0 & \frac{-7}{5} & \frac{43}{5} & 0 \end{array}\right) \times\left(\frac{7}{5}\right) \overset{?}{\sim} F_3 - \left(\frac{-7}{5}\right)\cdot F_2 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{3}{5} & \frac{-2}{5} & 0 \\ 0 & 1 & \frac{-49}{11} & 0 \\ 0 & 0 & \frac{26}{11} & 0 \end{array}\right) \times\left(\frac{11}{26}\right) \overset{?}{\sim} F_3/\left(\frac{26}{11}\right) \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{3}{5} & \frac{-2}{5} & 0 \\ 0 & 1 & \frac{-49}{11} & 0 \\ 0 & 0 & 1 & 0 \end{array}\right) \times\left(\frac{49}{11}\right) \overset{?}{\sim} F_2 - \left(\frac{-49}{11}\right)\cdot F_3 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{3}{5} & \frac{-2}{5} & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{array}\right) \times\left(\frac{2}{5}\right) \overset{?}{\sim} F_1 - \left(\frac{-2}{5}\right)\cdot F_3 \to F_1$$

$$\left(\begin{array}{ccc|c} 1 & \frac{3}{5} & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{array}\right) \times\left(\frac{-3}{5}\right) \overset{?}{\sim} F_1 - \left(\frac{3}{5}\right)\cdot F_2 \to F_1 \left(\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{array}\right)$$

$$\begin{cases} x_1 = 0 \\ x_2 = 0 \quad (1) \\ x_3 = 0 \end{cases}$$

- De la ecuación 3 del sistema (1) encontramos con la variable $x_3$:
  $x_3 = 0$
- De la ecuación 2 del sistema (1) encontramos con la variable $x_2$:
  $x_2 = 0$
- De la ecuación 1 del sistema (1) encontramos con la variable $x_1$:
  $x_1 = 0$

La respuesta:
$x_1 = 0$
$x_2 = 0$
$x_3 = 0$

La solución general: $X = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$

Norma
La naturaleza es parte de ti ¡Cuídala!
Papel de oficina de calidad

b) $2v_1 + 6v_2 + 7v_3 = 3$

$4v_1 - 5v_2 + 8v_3 = 2$

$v_1 - 9v_2 + 4v_3 = 7$

$V_1 = -3{,}49\ V$

$V_2 = -0{,}38\ V$

$V_3 = 1{,}75\ V$

Transformar la matriz aumentada del sistema em uma matriz en forma escalonada:

$$\left(\begin{array}{ccc|c} -4 & 5 & -3 & 1 \\ 2 & -5 & 9 & 2 \\ -6 & 3 & -1 & 3 \end{array}\right) \times\left(\frac{-1}{4}\right) \overset{?}{\sim} F_1/(-4) \to F_1 \left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & \frac{3}{4} & \frac{-1}{4} \\ 2 & -5 & 9 & 2 \\ -6 & 3 & -1 & 3 \end{array}\right) \times(-2) \overset{?}{\sim} F_2 - 2\cdot F_1 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & \frac{3}{4} & \frac{-1}{4} \\ 0 & \frac{-5}{2} & \frac{15}{2} & \frac{5}{2} \\ -6 & 3 & -1 & 3 \end{array}\right) \times(6) \overset{?}{\sim} F_3 - (-6)\cdot F_1 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & \frac{3}{4} & \frac{-1}{4} \\ 0 & \frac{-5}{2} & \frac{15}{2} & \frac{5}{2} \\ 0 & \frac{-9}{2} & \frac{7}{2} & \frac{3}{2} \end{array}\right) \times\left(\frac{-2}{5}\right) \overset{?}{\sim} F_2/\left(\frac{-5}{2}\right) \to F_2$$

$$\left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & \frac{3}{4} & \frac{-1}{4} \\ 0 & 1 & -3 & -1 \\ 0 & \frac{-9}{2} & \frac{7}{2} & \frac{3}{2} \end{array}\right) \overset{?}{\sim} F_2 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & \frac{3}{4} & \frac{-1}{4} \\ 0 & 1 & -3 & -1 \\ 0 & 0 & -10 & -3 \end{array}\right) \times\left(\frac{-1}{10}\right) \overset{?}{\sim} F_3/(-10) \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & \frac{3}{4} & \frac{-1}{4} \\ 0 & 1 & -3 & -1 \\ 0 & 0 & 1 & \frac{3}{10} \end{array}\right) \times(3)\ F_2 - (-3)\cdot F_3 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & \frac{3}{4} & \frac{-1}{4} \\ 0 & 1 & 0 & \frac{-1}{10} \\ 0 & 0 & 1 & \frac{3}{10} \end{array}\right) \times\left(\frac{-3}{4}\right)$$

$a_{1,2} = \frac{-5}{4} - \frac{3}{4}\cdot 1 \cdot 0 = \frac{-5}{4}$

$$\overset{?}{\sim} F_1 - \left(\frac{3}{4}\right)\cdot F_3 \to F_1 \left(\begin{array}{ccc|c} 1 & \frac{-5}{4} & 0 & \frac{-19}{40} \\ 0 & 1 & 0 & \frac{-1}{10} \\ 0 & 0 & 1 & \frac{3}{10} \end{array}\right) \times\left(\frac{5}{4}\right) \overset{?}{\sim} F_1 - \left(\frac{-5}{4}\right)\cdot F_2 \to F_1 \left(\begin{array}{ccc|c} 1 & 0 & 0 & \frac{-3}{5} \\ 0 & 1 & 0 & \frac{-1}{10} \\ 0 & 0 & 1 & \frac{3}{10} \end{array}\right)$$

$$\begin{cases} x_1 = \frac{-3}{5} \\ x_2 = \frac{-1}{10} \quad (1) \\ x_3 = \frac{3}{10} \end{cases}$$

- De la ecuación 3 del sistema (1) encontramos con la variable $x_3$:
  $x_3 = \frac{3}{10}$
- De la ecuación 2 del sistema (1) encontramos con la variable $x_2$:
  $x_2 = \frac{-1}{10}$
- De la ecuación 1 del sistema (1) encontramos con la variable $x_1$:
  $x_1 = \frac{-3}{5}$

La respuesta:

$x_1 = \frac{-3}{5}$

$x_2 = \frac{-1}{10}$

$x_3 = \frac{3}{10}$

La solución general: $X = \begin{pmatrix} \frac{-3}{5} \\ \frac{-1}{10} \\ \frac{3}{10} \end{pmatrix}$

c) $-4v_1 + 3v_2 + 6v_3 = 3$

$5v_1 + 7v_2 + 8v_3 = 2$

$v_1 + v_2 + v_3 = 1$

$V_1 = -15\ V$

$V_2 = 51\ V$

$V_3 = -35\ V$

Transformar la matriz aumentada del sistema em uma matriz en forma escalonada:

$$\left(\begin{array}{ccc|c} 2 & 7 & 5 & 3 \\ 1 & 3 & 5 & 9 \\ 3 & 6 & 4 & 1 \end{array}\right) \times\left(\frac{1}{2}\right) \overset{?}{\sim} F_1/(2) \to F_1 \left(\begin{array}{ccc|c} 1 & \frac{7}{2} & \frac{5}{2} & \frac{3}{2} \\ 1 & 3 & 5 & 9 \\ 3 & 6 & 4 & 1 \end{array}\right) \times(-1) \overset{?}{\sim} F_2 - 1\cdot F_1 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{7}{2} & \frac{5}{2} & \frac{3}{2} \\ 0 & \frac{-1}{2} & \frac{5}{2} & \frac{15}{2} \\ 3 & 6 & 4 & 1 \end{array}\right) \times(-3) \overset{?}{\sim} F_3 - 3\cdot F_1 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{7}{2} & \frac{5}{2} & \frac{3}{2} \\ 0 & \frac{-1}{2} & \frac{5}{2} & \frac{15}{2} \\ 0 & \frac{-9}{2} & \frac{-7}{2} & \frac{-7}{2} \end{array}\right) \times(-2) \overset{?}{\sim} F_2/\left(\frac{-1}{2}\right) \to F_2$$

$$\left(\begin{array}{ccc|c} 1 & \frac{7}{2} & \frac{5}{2} & \frac{3}{2} \\ 0 & 1 & -5 & -15 \\ 0 & \frac{-9}{2} & \frac{-7}{2} & \frac{-7}{2} \end{array}\right) \times\left(\frac{9}{2}\right) \overset{?}{\sim} F_3 - \left(\frac{-9}{2}\right)\cdot F_2 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{7}{2} & \frac{5}{2} & \frac{3}{2} \\ 0 & 1 & -5 & -15 \\ 0 & 0 & -26 & -71 \end{array}\right) \times\left(\frac{-1}{26}\right) \overset{?}{\sim} F_3/(-26) \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{7}{2} & \frac{5}{2} & \frac{3}{2} \\ 0 & 1 & -5 & -15 \\ 0 & 0 & 1 & \frac{71}{26} \end{array}\right) \times(5)\ F_2 - (-5)\cdot F_3 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{7}{2} & \frac{5}{2} & \frac{3}{2} \\ 0 & 1 & 0 & \frac{-35}{26} \\ 0 & 0 & 1 & \frac{71}{26} \end{array}\right) \times\left(\frac{-5}{2}\right)$$

$$\overset{?}{\sim} F_1 - \left(\frac{5}{2}\right)\cdot F_3 \to F_1 \left(\begin{array}{ccc|c} 1 & \frac{7}{2} & 0 & \frac{-277}{52} \\ 0 & 1 & 0 & \frac{-35}{26} \\ 0 & 0 & 1 & \frac{71}{26} \end{array}\right) \times\left(\frac{-7}{2}\right) \overset{?}{\sim} F_1 - \left(\frac{7}{2}\right)\cdot F_2 \to F_1 \left(\begin{array}{ccc|c} 1 & 0 & 0 & \frac{-8}{13} \\ 0 & 1 & 0 & \frac{-35}{26} \\ 0 & 0 & 1 & \frac{71}{26} \end{array}\right)$$

$$\begin{cases} x_1 = \frac{-8}{13} \\ x_2 = \frac{-35}{26} \quad (1) \\ x_3 = \frac{71}{26} \end{cases}$$

- De la ecuación 3 del sistema (1) encontramos con la variable $x_3$:
  $x_3 = \frac{71}{26}$
- De la ecuación 2 del sistema (1) encontramos con la variable $x_2$:
  $x_2 = \frac{-35}{26}$
- De la ecuación 1 del sistema (1) encontramos con la variable $x_1$:
  $x_1 = \frac{-8}{13}$

La respuesta:

$x_1 = \frac{-8}{13}$

$x_2 = \frac{-35}{26}$

$x_3 = \frac{71}{26}$

La solución general: $X = \begin{pmatrix} \frac{-8}{13} \\ \frac{-35}{26} \\ \frac{71}{26} \end{pmatrix}$

d) $v_1 + 2v_2 + 3v_3 = 0$

$2v_1 + 3v_2 + 5v_3 = 0$

$8v_1 + 8v_2 + 6v_3 = 1$

$V_1 = 0{,}2\ V$ //

$V_2 = 0{,}2\ V$ //

$V_3 = -0{,}2\ V$ //

Transformar la matriz aumentada del sistema em uma matriz en forma escalonada:

$$\left(\begin{array}{ccc|c} -3 & 5 & 2 & 0 \\ 4 & 5 & 6 & 1 \\ 1 & 1 & 7 & 3 \end{array}\right) \times\left(\frac{-1}{3}\right) \overset{?}{\sim} F_1/(-3) \to F_1 \left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & \frac{-2}{3} & 0 \\ 4 & 5 & 6 & 1 \\ 1 & 1 & 7 & 3 \end{array}\right) \times(-4) \overset{?}{\sim} F_2 - 4\cdot F_1 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & \frac{-2}{3} & 0 \\ 0 & \frac{35}{3} & \frac{26}{3} & 1 \\ 1 & 1 & 7 & 3 \end{array}\right) \times(-1) \overset{?}{\sim} F_3 - 1\cdot F_1 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & \frac{-2}{3} & 0 \\ 0 & \frac{35}{3} & \frac{26}{3} & 1 \\ 0 & \frac{8}{3} & \frac{23}{3} & 3 \end{array}\right) \times\left(\frac{3}{35}\right) \overset{?}{\sim} F_2/\left(\frac{35}{3}\right) \to F_2$$

$$\left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & \frac{-2}{3} & 0 \\ 0 & 1 & \frac{26}{35} & \frac{3}{35} \\ 0 & \frac{8}{3} & \frac{23}{3} & 3 \end{array}\right) \times\left(\frac{-8}{3}\right) \overset{?}{\sim} F_3 - \left(\frac{8}{3}\right)\cdot F_2 \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & \frac{-2}{3} & 0 \\ 0 & 1 & \frac{26}{35} & \frac{3}{35} \\ 0 & 0 & \frac{199}{35} & \frac{97}{35} \end{array}\right) \times\left(\frac{35}{199}\right) \overset{?}{\sim} F_3/\left(\frac{199}{35}\right) \to F_3 \left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & \frac{-2}{3} & 0 \\ 0 & 1 & \frac{26}{35} & \frac{3}{35} \\ 0 & 0 & 1 & \frac{97}{199} \end{array}\right) \times\left(\frac{-26}{35}\right) \overset{?}{\sim} F_2 - \left(\frac{26}{35}\right)\cdot F_3 \to F_2 \left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & \frac{-2}{3} & 0 \\ 0 & 1 & 0 & \frac{-55}{199} \\ 0 & 0 & 1 & \frac{97}{199} \end{array}\right) \times\left(\frac{2}{3}\right)$$

$$\overset{?}{\sim} F_1 - \left(\frac{-2}{3}\right)\cdot F_3 \to F_1 \left(\begin{array}{ccc|c} 1 & \frac{-5}{3} & 0 & \frac{194}{597} \\ 0 & 1 & 0 & \frac{-55}{199} \\ 0 & 0 & 1 & \frac{97}{199} \end{array}\right) \times\left(\frac{5}{3}\right) \overset{?}{\sim} F_1 - \left(\frac{-5}{3}\right)\cdot F_2 \to F_1 \left(\begin{array}{ccc|c} 1 & 0 & 0 & \frac{-27}{199} \\ 0 & 1 & 0 & \frac{-55}{199} \\ 0 & 0 & 1 & \frac{97}{199} \end{array}\right)$$

$$\begin{cases} x_1 = \frac{-27}{199} \\ x_2 = \frac{-55}{199} \quad (1) \\ x_3 = \frac{97}{199} \end{cases}$$

- De la ecuación 3 del sistema (1) encontramos con la variable $x_3$:
  $x_3 = \frac{97}{199}$
- De la ecuación 2 del sistema (1) encontramos con la variable $x_2$:
  $x_2 = \frac{-55}{199}$
- De la ecuación 1 del sistema (1) encontramos con la variable $x_1$:
  $x_1 = \frac{-27}{199}$

La respuesta:

$x_1 = \frac{-27}{199}$

$x_2 = \frac{-55}{199}$

$x_3 = \frac{97}{199}$

La solución general: $X = \begin{pmatrix} \frac{-27}{199} \\ \frac{-55}{199} \\ \frac{97}{199} \end{pmatrix}$

e) $-4V_1 + 5V_2 - 3V_3 = 1$

$2V_1 - 5V_2 + 9V_3 = 2$

$-6V_1 + 3V_2 - V_3 = 3$

$V_1 = -0{,}6\ V$

$V_2 = -0{,}1\ V$

$V_3 = 0{,}3\ V$

Transformar la matriz aumentada del sistema em uma matriz en forma escalonada:

$$\left(\begin{array}{ccc|c} 2 & 6 & 7 & 3 \\ 4 & -5 & 8 & 2 \\ 1 & -9 & 4 & 7 \end{array}\right) \times\left(\frac{1}{2}\right) \underset{F_1/(2)\to F_1}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 3 & \frac{7}{2} & \frac{3}{2} \\ 4 & -5 & 8 & 2 \\ 1 & -9 & 4 & 7 \end{array}\right) \times(-4) \underset{F_2-4\cdot F_1\to F_2}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 3 & \frac{7}{2} & \frac{3}{2} \\ 0 & -17 & -6 & -4 \\ 1 & -9 & 4 & 7 \end{array}\right) \times(-1) \underset{F_3-1\cdot F_1\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 3 & \frac{7}{2} & \frac{3}{2} \\ 0 & -17 & -6 & -4 \\ 0 & -12 & \frac{1}{2} & \frac{11}{2} \end{array}\right) \times\left(\frac{-1}{17}\right) \underset{F_2/(-17)\to F_2}{\overset{?}{\sim}}$$

$$\left(\begin{array}{ccc|c} 1 & 3 & \frac{7}{2} & \frac{3}{2} \\ 0 & 1 & \frac{6}{17} & \frac{4}{17} \\ 0 & -12 & \frac{1}{2} & \frac{11}{2} \end{array}\right) \times(12) \underset{F_3-(-12)\cdot F_2\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 3 & \frac{7}{2} & \frac{3}{2} \\ 0 & 1 & \frac{6}{17} & \frac{4}{17} \\ 0 & 0 & \frac{161}{34} & \frac{283}{34} \end{array}\right) \times\left(\frac{34}{161}\right) \underset{F_3/\left(\frac{161}{34}\right)\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 3 & \frac{7}{2} & \frac{3}{2} \\ 0 & 1 & \frac{6}{17} & \frac{4}{17} \\ 0 & 0 & 1 & \frac{283}{161} \end{array}\right) \times\left(\frac{-6}{17}\right) \underset{F_2-\left(\frac{6}{17}\right)\cdot F_3\to F_2}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 3 & \frac{7}{2} & \frac{3}{2} \\ 0 & 1 & 0 & \frac{-62}{161} \\ 0 & 0 & 1 & \frac{283}{161} \end{array}\right) \times\left(\frac{-7}{2}\right)$$

$$\underset{F_1-\left(\frac{7}{2}\right)\cdot F_3\to F_1}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 3 & 0 & \frac{-107}{23} \\ 0 & 1 & 0 & \frac{-62}{161} \\ 0 & 0 & 1 & \frac{283}{161} \end{array}\right) \times(-3) \underset{F_1-3\cdot F_2\to F_1}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 0 & 0 & \frac{-563}{161} \\ 0 & 1 & 0 & \frac{-62}{161} \\ 0 & 0 & 1 & \frac{283}{161} \end{array}\right)$$

$$\begin{cases} x_1 = \frac{-563}{161} \\ x_2 = \frac{-62}{161} \quad (1) \\ x_3 = \frac{283}{161} \end{cases}$$

- De la ecuación 3 del sistema (1) encontramos con la variable $x_3$:
  $x_3 = \frac{283}{161}$
- De la ecuación 2 del sistema (1) encontramos con la variable $x_2$:
  $x_2 = \frac{-62}{161}$
- De la ecuación 1 del sistema (1) encontramos con la variable $x_1$:
  $x_1 = \frac{-563}{161}$

La respuesta:

$x_1 = \frac{-563}{161}$

$x_2 = \frac{-62}{161}$

$x_3 = \frac{283}{161}$

La solución general: $X = \begin{pmatrix} \frac{-563}{161} \\ \frac{-62}{161} \\ \frac{283}{161} \end{pmatrix}$

f) $2V_1 + 7V_2 + 5V_3 = 3$

$V_1 + 3V_2 + 5V_3 = 4$

$3V_1 + 6V_2 + 4V_3 = 1$

$V_1 = -0{,}61\ V$

$V_2 = -1{,}39\ V$

$V_3 = 2{,}73\ V$

Transformar la matriz aumentada del sistema em uma matriz en forma escalonada:

$$\left(\begin{array}{ccc|c} -4 & 3 & 6 & 3 \\ 5 & 7 & 8 & 2 \\ 1 & 1 & 1 & 1 \end{array}\right) \times\left(\frac{-1}{4}\right) \underset{F_1/(-4)\to F_1}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & \frac{-3}{2} & \frac{-3}{4} \\ 5 & 7 & 8 & 2 \\ 1 & 1 & 1 & 1 \end{array}\right) \times(-5) \underset{F_2-5\cdot F_1\to F_2}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & \frac{-3}{2} & \frac{-3}{4} \\ 0 & \frac{43}{4} & \frac{31}{2} & \frac{23}{4} \\ 1 & 1 & 1 & 1 \end{array}\right) \times(-1) \underset{F_3-1\cdot F_1\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & \frac{-3}{2} & \frac{-3}{4} \\ 0 & \frac{43}{4} & \frac{31}{2} & \frac{23}{4} \\ 0 & \frac{7}{4} & \frac{5}{2} & \frac{7}{4} \end{array}\right) \times\left(\frac{4}{43}\right) \underset{F_2/\left(\frac{43}{4}\right)\to F_2}{\overset{?}{\sim}}$$

$$\left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & \frac{-3}{2} & \frac{-3}{4} \\ 0 & 1 & \frac{62}{43} & \frac{23}{43} \\ 0 & \frac{7}{4} & \frac{5}{2} & \frac{7}{4} \end{array}\right) \times\left(\frac{-7}{4}\right) \underset{F_3-\left(\frac{7}{4}\right)\cdot F_2\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & \frac{-3}{2} & \frac{-3}{4} \\ 0 & 1 & \frac{62}{43} & \frac{23}{43} \\ 0 & 0 & \frac{-1}{43} & \frac{35}{43} \end{array}\right) \times(-43) \underset{F_3/\left(\frac{-1}{43}\right)\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & \frac{-3}{2} & \frac{-3}{4} \\ 0 & 1 & \frac{62}{43} & \frac{23}{43} \\ 0 & 0 & 1 & -35 \end{array}\right) \times\left(\frac{-62}{43}\right) \underset{F_2-\left(\frac{62}{43}\right)\cdot F_3\to F_2}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & \frac{-3}{2} & \frac{-3}{4} \\ 0 & 1 & 0 & 51 \\ 0 & 0 & 1 & -35 \end{array}\right) \times\left(\frac{3}{2}\right)$$

$$\underset{F_1-\left(\frac{-3}{2}\right)\cdot F_3\to F_1}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & \frac{-3}{4} & 0 & \frac{-213}{4} \\ 0 & 1 & 0 & 51 \\ 0 & 0 & 1 & -35 \end{array}\right) \times\left(\frac{3}{4}\right) \underset{F_1-\left(\frac{-3}{4}\right)\cdot F_2\to F_1}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 0 & 0 & -15 \\ 0 & 1 & 0 & 51 \\ 0 & 0 & 1 & -35 \end{array}\right)$$

$$\begin{cases} x_1 = -15 \\ x_2 = 51 \quad (1) \\ x_3 = -35 \end{cases}$$

- De la ecuación 3 del sistema (1) encontramos con la variable $x_3$:
  $x_3 = -35$
- De la ecuación 2 del sistema (1) encontramos con la variable $x_2$:
  $x_2 = 51$
- De la ecuación 1 del sistema (1) encontramos con la variable $x_1$:
  $x_1 = -15$

La respuesta:

$x_1 = -15$

$x_2 = 51$

$x_3 = -35$

La solución general: $X = \begin{pmatrix} -15 \\ 51 \\ -35 \end{pmatrix}$

g) $-3V_1 + 5V_2 + 2V_3 = 0$

$4V_1 + 5V_2 + 6V_3 = 1$

$V_1 + V_2 + 7V_3 = 3$

$V_1 = -0{,}13\ V$

$V_2 = -0{,}27\ V$

$V_3 = 0{,}48\ V$

Transformar la matriz aumentada del sistema em uma matriz en forma escalonada:

$$\left(\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 2 & 3 & 5 & 0 \\ 3 & 8 & 6 & 1 \end{array}\right) \times(-2) \underset{F_2-2\cdot F_1\to F_2}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 0 & -1 & -1 & 0 \\ 3 & 8 & 6 & 1 \end{array}\right) \times(-3) \underset{F_3-3\cdot F_1\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 0 & -1 & -1 & 0 \\ 0 & 2 & -3 & 1 \end{array}\right) \times(-1) \underset{F_2/(-1)\to F_2}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 2 & -3 & 1 \end{array}\right) \times(-2) \underset{F_3-2\cdot F_2\to F_3}{\overset{?}{\sim}}$$

$$\left(\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & -5 & 1 \end{array}\right) \times\left(\frac{-1}{5}\right) \underset{F_3/(-5)\to F_3}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & \frac{-1}{5} \end{array}\right) \times(-1) \underset{F_2-1\cdot F_3\to F_2}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 0 & 1 & 0 & \frac{1}{5} \\ 0 & 0 & 1 & \frac{-1}{5} \end{array}\right) \times(-3) \underset{F_1-3\cdot F_3\to F_1}{\overset{?}{\sim}} \left(\begin{array}{ccc|c} 1 & 2 & 0 & \frac{3}{5} \\ 0 & 1 & 0 & \frac{1}{5} \\ 0 & 0 & 1 & \frac{-1}{5} \end{array}\right) \times(-2) \underset{F_1-2\cdot F_2\to F_1}{\overset{?}{\sim}}$$

$$\left(\begin{array}{ccc|c} 1 & 0 & 0 & \frac{1}{5} \\ 0 & 1 & 0 & \frac{1}{5} \\ 0 & 0 & 1 & \frac{-1}{5} \end{array}\right)$$

$$\begin{cases} x_1 = \frac{1}{5} \\ x_2 = \frac{1}{5} \quad (1) \\ x_3 = \frac{-1}{5} \end{cases}$$

- De la ecuación 3 del sistema (1) encontramos con la variable $x_3$:
  $x_3 = \frac{-1}{5}$
- De la ecuación 2 del sistema (1) encontramos con la variable $x_2$:
  $x_2 = \frac{1}{5}$
- De la ecuación 1 del sistema (1) encontramos con la variable $x_1$:
  $x_1 = \frac{1}{5}$

La respuesta:

$x_1 = \frac{1}{5}$

$x_2 = \frac{1}{5}$

$x_3 = \frac{-1}{5}$

La solución general: $X = \begin{pmatrix} \frac{1}{5} \\ \frac{1}{5} \\ \frac{-1}{5} \end{pmatrix}$

Norma La fibra de caña de azúcar es totalmente responsable con el medio ambiente. Pape de caña de azúcar