# ACTIVIDAD 1

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

$$\Delta = \begin{vmatrix} 1 & 2 & 1 \\ 1 & -1 & 2 \\ 2 & 1 & -1 \\ 1 & 2 & 1 \\ 1 & -1 & 2 \end{vmatrix} = (1+1+8) - (-2+2-2) = (10) - (-2) = 12$$

$$\Delta_x = \begin{vmatrix} -1 & 2 & 1 \\ 2 & -1 & 2 \\ -11 & 1 & -1 \\ -1 & 2 & 1 \\ 2 & -1 & 2 \end{vmatrix} = (-1+2-44) - (11-2-4) = (-43)-(5) = -48$$

$$\Delta_y = \begin{vmatrix} 1 & -1 & 1 \\ 1 & 2 & 2 \\ 2 & -11 & -1 \\ 1 & -1 & 1 \\ 1 & 2 & 2 \end{vmatrix} = (-2-11-4) - (4-22+1) = (-17)-(-17) = 0$$

$$\Delta_z = \begin{vmatrix} 1 & 2 & -1 \\ 1 & -1 & 2 \\ 2 & 1 & -11 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{vmatrix} = (11-1+8) - (2+2-22) = (18)-(-18) = 36$$

$$\textit{Solución}$$

$$x = \frac{\Delta_x}{\Delta} = \frac{-48}{12} = -4$$

$$y = \frac{\Delta_y}{\Delta} = \frac{0}{12} = 0$$

$$z = \frac{\Delta_z}{\Delta} = \frac{36}{12} = 3$$

# ACTIVIDAD 2

$$0\,x\ +\ 0\,y\ =\ 2 \qquad \textit{Incompatible}$$
$$2\,x\ =\ 6 \qquad \textit{Compatible Determinado}$$
$$0\,x+\ 0\,y\ =\ 0 \quad \textit{Compatible Indeterminado}$$

## ACTIVIDAD 3
Método de Cramer

$$\textit{Punto}\ (a)$$
$$\begin{cases} 2x+2y & = 4 \\ 3x-y & = 1 \end{cases}$$

$$\textit{Determinantes}$$
$$\Delta = \begin{vmatrix} 2 & 2 \\ 3 & -1 \end{vmatrix} = \ -2-6 = \ -8$$

$$\Delta_x = \begin{vmatrix} 4 & 2 \\ 1 & -1 \end{vmatrix} = -4-2 = \ -6$$

$$\Delta_y = \begin{vmatrix} 2 & 4 \\ 3 & 1 \end{vmatrix} = 2-12 = \ -10$$

$$\textit{Soluciones}$$
$$x\ =\ \frac{\Delta_x}{\Delta} = \frac{-6}{-8} = \frac{3}{4}$$

$$y\ =\ \frac{\Delta_y}{\Delta} = \frac{-10}{-8} = \frac{5}{4}$$

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$$\textit{Punto}\ (b)$$
$$\begin{cases} 2x+4y & = 4 \\ 3x+6y & = 8 \end{cases}$$

$$\textit{Determinantes}$$
$$\Delta = \begin{vmatrix} 2 & 4 \\ 3 & 6 \end{vmatrix} = \ 12-12 = 0$$

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*Solución*
*No se puede proseguir.*
*El determinante es cero,*
*de continuar, implicaría*
*divisiones sobre cero.*
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*Analizar*

$$\Delta_x = \begin{vmatrix} 4 & 4 \\ 8 & 6 \end{vmatrix} = 24 - 32 = -8$$

*CONCLUSIÓN:*
*Al menos uno de los otros determinantes no es cero.*
*Por tanto, por sus propiedades, el sistema no tiene solución.*
*Es decir, es un sistema incompatible.*

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*Punto (c)*

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

*Desarrollo*

$$Para\ x + y = 1$$
$$x = (1 - y)$$

$$Para\ x - 2z = 3\ aplicando\ x = (1 - y)$$
$$(1 - y) - 2z = 3$$

$$y = 1 - 3 - 2z$$
$$y = (-2 - 2z)$$

$$Para\ y + 4z = 1$$
$$4z = 1 - y$$
$$z = \left(\frac{1}{4} - \frac{y}{4}\right)$$

$$Para\ z = \left(\frac{1}{4} - \frac{y}{4}\right)\ aplicando\ y = (-2 - 2z)$$

$$z = \frac{1}{4} - \frac{1}{4}(-2-2z)$$

$$z = \frac{1}{4} - \left(-\frac{1}{2} - \frac{1}{2}z\right)$$

$$z = \frac{1}{4} + \frac{1}{2} + \frac{1}{2}z$$

$$z = \frac{3}{4} + \frac{1}{2}z$$

$$z - \frac{1}{2}z = \frac{3}{4}$$

$$\frac{z}{2} = \frac{3}{4}$$

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

$$Para\ y = (-2-2z)\ aplicando\ z = \frac{3}{2}$$

$$y = -2 - 2\frac{3}{2}$$

$$y = -2 - 3$$

$$y = -5$$

$$Para\ x = (1-y)\ \ aplicando\ y = -5$$

$$x = 1 - (-5)$$

$$x = 6$$

*Solución*

$$x = 6 \ \wedge \ y = -5 \ \wedge \ z = \frac{3}{2}$$

*SOLUCIÓN USANDO MATRICES*

$$\begin{cases} x + y = 1 \\ x - 2z = 3 \\ y + 4z = 1 \end{cases} Prolijando: \begin{cases} 1x + 1y + 0z = 1 \\ 1x + 0y - 2z = 3 \\ 0x + 1y + 4z = 1 \end{cases}$$

$$\Delta = \begin{vmatrix} 1 & 1 & 0 \\ 1 & 0 & -2 \\ 0 & 1 & 4 \\ 1 & 1 & 0 \\ 1 & 0 & -2 \end{vmatrix} = (0+0+0) - (0-2+4) = (0) - (2) = -2$$

$$\Delta_x = \begin{vmatrix} 1 & 1 & 0 \\ 3 & 0 & -2 \\ 1 & 1 & 4 \\ 1 & 1 & 0 \\ 3 & 0 & -2 \end{vmatrix} = (0+0-2) - (0-2+12) = (-2) - (10) = -12$$

$$\Delta_y = \begin{vmatrix} 1 & 1 & 0 \\ 1 & 3 & -2 \\ 0 & 1 & 4 \\ 1 & 1 & 0 \\ 1 & 3 & -2 \end{vmatrix} = (12+0+0) - (0-2+4) = (12) - (2) = 10$$

$$\Delta_z = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 0 & 3 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 3 \end{vmatrix} = (0+1+0) - (0+3+1) = (1) - (4) = -3$$

*Solución*

$$x = \frac{\Delta_x}{\Delta} = \frac{-12}{-2} = 6$$

$$y = \frac{\Delta_y}{\Delta} = \frac{10}{-2} = -5$$

$$z = \frac{\Delta_z}{\Delta} = \frac{-3}{-2} = \frac{3}{2}$$

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*Punto* (*d*)

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

$$\Delta = \begin{vmatrix} 2 & 3 & 1 \\ 1 & 1 & -1 \\ -1 & -1 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & -1 \end{vmatrix} = (\,2-1+3\,) - (\,-1+2+3\,) = (\,4\,) - (\,4\,) = 0 \quad (1)$$

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*Solución*
*No se puede proseguir.*
*El determinante es cero,*
*de continuar, implicaría*
*divisiones sobre cero.*

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*ANÁLISIS*

$$\Delta_x = \begin{vmatrix} 7 & 3 & 1 \\ 4 & 1 & -1 \\ -4 & -1 & 1 \\ 7 & 3 & 1 \\ 4 & 1 & -1 \end{vmatrix} = (\,7-4+12\,) - (\,-4+7+12\,) = (\,15\,) - (\,15\,) = 0$$

$$\Delta_y = \begin{vmatrix} 2 & 7 & 1 \\ 1 & 4 & -1 \\ -1 & -4 & 1 \\ 2 & 7 & 1 \\ 1 & 4 & -1 \end{vmatrix} = (\,8-4+7\,) - (\,-4+8+7\,) = (\,11\,) - (\,11\,) = 0$$

$$\Delta_z = \begin{vmatrix} 2 & 3 & 7 \\ 1 & 1 & 4 \\ -1 & -1 & -4 \\ 2 & 3 & 7 \\ 1 & 1 & 4 \end{vmatrix} = (-8-7-12\,) - (\,-7-8-12\,) = (\,-27\,) - (\,-27\,) = 0$$

*CONCLUSIÓN*
*Si todos los otros determinantes son ceros, el sistema tiene infinitas soluciones.*
*Es decir, el sistema es compatible indeterminado.*

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$$SOLUCIÓN\ POR\ EL\ MÉTODO\ DE\ GAUSS-JORDAN$$

$$\left(\begin{array}{ccc|c} 2 & 3 & 1 & 7 \\ 1 & 1 & -1 & 4 \\ -1 & -1 & 1 & -4 \end{array}\right) F1/2 \left(\begin{array}{ccc|c} 1 & \frac{3}{2} & \frac{1}{2} & \frac{7}{2} \\ 1 & 1 & -1 & 4 \\ -1 & -1 & 1 & -4 \end{array}\right) F2-F1 \left(\begin{array}{ccc|c} 1 & \frac{3}{2} & \frac{1}{2} & \frac{7}{2} \\ 0 & -\frac{1}{2} & -\frac{3}{2} & \frac{1}{2} \\ -1 & -1 & 1 & -4 \end{array}\right)$$

$$F3+F1 \left(\begin{array}{ccc|c} 1 & \frac{3}{2} & \frac{1}{2} & \frac{7}{2} \\ 0 & -\frac{1}{2} & -\frac{3}{2} & \frac{1}{2} \\ 0 & \frac{1}{2} & \frac{3}{2} & -\frac{1}{2} \end{array}\right) F2/\left(-\frac{1}{2}\right) \left(\begin{array}{ccc|c} 1 & \frac{3}{2} & \frac{1}{2} & \frac{7}{2} \\ 0 & 1 & 3 & -1 \\ 0 & \frac{1}{2} & \frac{3}{2} & -\frac{1}{2} \end{array}\right)$$

$$F3-\left(\frac{1}{2}\right)F2 \left(\begin{array}{ccc|c} 1 & \frac{3}{2} & \frac{1}{2} & \frac{7}{2} \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{array}\right) F1-\left(\frac{3}{2}\right)F2 \left(\begin{array}{ccc|c} 1 & 0 & -4 & 5 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{array}\right)$$

*ANÁLISIS*
*Fila cero en matrices reducidas indica infinitas soluciones.*
*Es decir, es un sistema compatible indeterminado.*

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*Punto (e)*

$$\begin{cases} x + y = 3 \\ y + z = 5 \\ x + z = 4 \end{cases}$$

*Desarrollo*

$$\Delta = \begin{vmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{vmatrix} = (1+0+1) - (0+0+0) = (2) - (0) = 2$$

$$\Delta_x = \begin{vmatrix} 3 & 1 & 0 \\ 5 & 1 & 1 \\ 4 & 0 & 1 \\ 3 & 1 & 0 \\ 5 & 1 & 1 \end{vmatrix} = (3+0+4) - (0+0+5) = (7)-(5) = 2$$

$$\Delta_y = \begin{vmatrix} 1 & 3 & 0 \\ 0 & 5 & 1 \\ 1 & 4 & 1 \\ 1 & 3 & 0 \\ 0 & 5 & 1 \end{vmatrix} = (5+0+3) - (0+4+0) = (8)-(4) = 4$$

$$\Delta_z = \begin{vmatrix} 1 & 1 & 3 \\ 0 & 1 & 5 \\ 1 & 0 & 4 \\ 1 & 1 & 3 \\ 0 & 1 & 5 \end{vmatrix} = (4+0+5) - (3+0+0) = (9)-(3) = 6$$

*Soluciones*

$$x = \frac{\Delta_x}{\Delta} = \frac{2}{2} = 1$$

$$y = \frac{\Delta_y}{\Delta} = \frac{4}{2} = 2$$

$$z = \frac{\Delta_z}{\Delta} = \frac{6}{2} = 3$$

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*Punto* $(f)$

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

(*ya realizado en el punto d*)