

### Exercício Regra de Cramer

$$\text{01-a)} \begin{cases} 2x - y = 2 \\ -x + 3y = -3 \end{cases} \quad D = \begin{vmatrix} 2 & -1 \\ -1 & 3 \end{vmatrix} = 6 - 1 = 5$$

$$D_x = \begin{vmatrix} 2 & -1 \\ -3 & 3 \end{vmatrix} = 6 - 3 = 3 \quad D_y = \begin{vmatrix} 2 & 2 \\ -1 & -3 \end{vmatrix} = -6 - (-2) = -4$$

$$x = \frac{D_x}{D} = \frac{3}{5} \quad y = \frac{D_y}{D} = \frac{-4}{5} \quad V = \left\{ \left( \frac{3}{5}, \frac{-4}{5} \right) \right\}$$

6)

$$3x - y + z = 1$$

$$2x + 3z = -1$$

$$4x + y - 2z = 7$$

D =

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

$$0 \cdot 9 \cdot 4 = 13$$

$$2 \cdot 0 \cdot 3 = -10 - 13 = -23$$

$$0 \cdot -12 \cdot 2 = -10$$

$$0 \cdot 3 \cdot -2 = 1$$

$$Dx = \begin{vmatrix} 1 & -1 & 1 \\ -1 & 0 & 3 \\ 7 & 1 & -2 \end{vmatrix}$$

$$x = \frac{Dx}{D} = \frac{-23}{-23} = 1$$

$$D \quad -23$$

$$0 \cdot -21 \cdot -1 = -22$$

$$y = \frac{Dy}{D} = \frac{-23}{-23} = 1$$

$$-4 \cdot 63 \cdot -4 = 55$$

$$D \quad -23$$

$$Dy = \begin{vmatrix} 3 & 1 & 1 \\ 2 & -1 & 3 \\ 4 & 7 & -2 \end{vmatrix}$$

$$z = \frac{Dz}{D} = \frac{23}{-23} = -1$$

$$D \quad -23$$

$$6 \cdot 12 \cdot 14 = 32$$

$$0 \cdot -3 \cdot -14 = -17$$

$$V = \{ (1, 1, -1) \}$$

$$Dz = \begin{vmatrix} 3 & -1 & 1 \\ 2 & 0 & -1 \\ 4 & 1 & 7 \end{vmatrix}$$

$$D \quad 4 \quad 2 = 6$$

$$02 - \begin{cases} 3x + 4y - z = 1 \\ 4x + 5y + 2z = 12 \\ x - 2y + 3z = 8 \end{cases}$$

D =

$$\begin{vmatrix} 3 & 4 & -1 \\ 4 & 5 & 2 \\ 1 & -2 & 3 \end{vmatrix}$$

$$-5 \cdot -12 \cdot 48 = 31$$

$$4 \cdot 5 \cdot 2 = 61 - 31 = 30$$

$$45 \cdot 8 \cdot 8 = 61$$

$$-12 \cdot 48 \cdot 12 = 48$$

$$Dy = \begin{vmatrix} 3 & 1 & -1 \\ 4 & 12 & 2 \\ 1 & 8 & 3 \end{vmatrix}$$

$$12 = 78 - 48 = 30$$

$$108 \cdot 2 \cdot -32 = 78$$

$$y = \frac{Dy}{D} = \frac{30}{30} = 1$$

$$y = 1$$

A

03-  $\begin{cases} x + 2y + z = 1 \\ 3x + y - 11z = -2 \\ 2x + 3y - z = 1 \end{cases}$   $D = \begin{vmatrix} 1 & 2 & 1 \\ 3 & 1 & -11 \\ 2 & 3 & -1 \end{vmatrix} = -36 + 37 = 1$

$DX = \begin{vmatrix} 1 & 2 & 1 \\ -2 & 1 & -11 \\ 1 & 3 & -1 \end{vmatrix} = -29 + 28 = -1$   $X = DX = -1 = -1$

$DY = \begin{vmatrix} 1 & 1 & 1 \\ 3 & -2 & -11 \\ 2 & 1 & -1 \end{vmatrix} = -17 + 18 = 1$   $Y = DY = 1 = 1$

$DZ = \begin{vmatrix} 1 & 2 & 1 \\ 3 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix} = 2 - 2 = 0$   $Z = DZ = 0 = 0$

(C)

04-  $\begin{cases} x + 2y - 3z = 29 \\ x + 3y + 2z = 4 \\ x - y - 2z = 8 \end{cases}$   $D = \begin{vmatrix} 1 & 2 & -3 \\ 1 & 3 & 2 \\ 1 & -1 & -2 \end{vmatrix} = -9 - 2 - 4 = -15$

$DX = \begin{vmatrix} 29 & 2 & -3 \\ 4 & 3 & 2 \\ 8 & -1 & -2 \end{vmatrix} = -130 + 146 = 16$

$DY = \begin{vmatrix} 1 & 29 & -3 \\ 1 & 4 & 2 \\ 1 & 8 & -2 \end{vmatrix} = 26 + 54 = 80$

Q S T Q Q S S  
D L M M J V S

$$87 - 4 \cdot 16 = 99$$

$$DZ = \begin{vmatrix} 1 & 2 & 29 & 1 & 2 \\ 1 & 3 & 4 & 1 & 3 \\ 1 & -1 & 8 & 1 & -1 \end{vmatrix} = 2 \cdot -99 = -96$$

$$x = \frac{Dx}{D} = \frac{16}{16} = 1$$

$$24 \cdot 8 - 29 = 3$$

$$y = \frac{Dy}{D} = \frac{80}{16} = 5$$

$$X + Y + Z$$

$$1 + 5 - 6 = 0 //$$

$$Z = \frac{Dz}{D} = \frac{-96}{16} = -6$$

⑤

$$\begin{cases} 2x + y = 5 \\ 2y + z = 3 \\ 3x + 2y + z = 7 \end{cases}$$

$$\begin{cases} 3x + 2y + z = 7 \\ 2y + z = 3 \end{cases} \cdot (-1)$$

$$3x = 4 \quad 2x + y = 5 \quad 2y + z = 3$$

$$\boxed{x = \frac{4}{3}}$$

$$2 \cdot \frac{4}{3} + y = 5$$

$$2 \cdot \frac{7}{3} + z = 3$$

$$y = \frac{5 - 8}{1} = \frac{-3}{1} = -3$$

$$z = \frac{3 - 14}{1} = \frac{-11}{1} = -11$$

$$y = \frac{15 - 8}{3} = \frac{7}{3}$$

$$z = \frac{9 - 14}{3} = \frac{-5}{3}$$

①

06 -

$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & 2 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \\ -1 \end{bmatrix}$$

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

$$2x + y = 7 \quad -x + 2y + 2z = -1$$

$$2 \cdot 3 + y = 7 \quad -3 + 2 \cdot 1 + 2z = -1$$

$$y = 7 - 6 \quad 2z = -1 + 1$$

$$y = 1 \quad z = \frac{0}{2}$$

$$\boxed{z = 0}$$

⑤



## Ejercicios Linealmente (com)

01- 
$$S = \begin{cases} 2x - y - 3z = -5 \\ x + 3y - z = 11 \\ x - 5z = 3 \end{cases}$$

$$\begin{pmatrix} 2 & -1 & -3 & -5 \\ 1 & 3 & -1 & 11 \\ 1 & 0 & -5 & 3 \end{pmatrix} \xrightarrow{-2R_1} \begin{pmatrix} 0 & -1 & 7 & -11 \\ 1 & 3 & -1 & 11 \\ 1 & 0 & -5 & 3 \end{pmatrix} \xrightarrow{-R_3} \begin{pmatrix} 0 & -1 & 7 & -11 \\ 1 & 3 & -1 & 11 \\ 0 & 3 & 4 & 8 \end{pmatrix} \xrightarrow{-3R_2} \begin{pmatrix} 0 & -1 & 7 & -11 \\ 1 & 0 & -5 & 3 \\ 0 & 3 & 4 & 8 \end{pmatrix} \xrightarrow{+R_2} \begin{pmatrix} 0 & -1 & 7 & -11 \\ 1 & 0 & -5 & 3 \\ 0 & 3 & 4 & 8 \end{pmatrix} \xrightarrow{-3R_2} \begin{pmatrix} 0 & -1 & 7 & -11 \\ 1 & 0 & -5 & 3 \\ 0 & 0 & -25 & 25 \end{pmatrix}$$

$$-25z = 25$$

$$\boxed{z = -1}$$

$$x - 5z = 3$$

$$x - 5(-1) = 3$$

$$x = 3 - 5$$

$$\boxed{x = -2}$$

$$x + 3y - z = 11$$

$$-2 + 3y + 1 = 11$$

$$3y = 12$$

$$\boxed{y = 4}$$

02- 
$$\begin{cases} x = 2y \\ 2y = 3z \\ x + y + z = 11 \end{cases}$$

$$\begin{aligned} x &= 2y \\ y &= \frac{x}{2} \end{aligned}$$

$$\begin{aligned} x &= 2y = 3z \Rightarrow x = 3z \\ x &= 3z \\ z &= \frac{x}{3} \end{aligned}$$

$$x + y + z = 11$$

$$x + x + x = 11$$

$$3x = 11$$

$$x = \frac{11}{3}$$

$$y = \frac{x}{2} = \frac{11}{6}$$

$$z = \frac{x}{3} = \frac{11}{9}$$

$$11x = 11$$

$$11x = 66$$

$$x = 6$$

$$2y = x$$

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

$$y = 3$$

$$y = 3$$

$$y = 3$$

$$y = 3$$

$$y = 3$$

$$y = 3$$

$$y = 3$$

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

$$z = 2$$

$$z = 6$$

$$z = 3$$

$$z = 2$$

$$z = 2$$

$$z = 2$$

$$z = 2$$

$$z = 2$$

$$x + 2y + 3z =$$

$$6 + 2 \cdot 3 + 3 \cdot 2 =$$

$$6 + 6 + 6 = \boxed{18}$$

$$6 + 6 + 6 = \boxed{18}$$

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B

$$03 - \begin{cases} x + y + z = 0 \\ 2x - y - 2z = 1 \\ 6y + 3z = -12 \end{cases}$$

$$\begin{pmatrix} 1 & 1 & 1 & 0 \\ 2 & -1 & -2 & 1 \\ 0 & 6 & 3 & -12 \end{pmatrix} \xrightarrow{-2R_1} \begin{pmatrix} 1 & 1 & 1 & 0 \\ 0 & -3 & -4 & 1 \\ 0 & 6 & 3 & -12 \end{pmatrix} \xrightarrow{2R_2} \begin{pmatrix} 1 & 1 & 1 & 0 \\ 0 & -3 & -4 & 1 \\ 0 & 0 & -5 & -10 \end{pmatrix}$$

$$-5z = -10$$

$$\boxed{z = 2}$$

①

$$04 - \begin{cases} x + y + z = 68 \\ y + 0,2z = x \\ 0,2x + z = 3y \end{cases}$$

$$20\% + 1 \cdot 100 = 1 \cdot 0,2$$

$$x + Ali \quad y + Bico \quad z + Coca$$

$$x = y + 0,2z$$

$$x + y + z = 68$$

$$(0,2z + y) + y + z = 68$$

$$1,2z + 2y = 68$$

$$2y = 68 - 1,2z$$

$$y = 34 - 0,6z$$

$$0,2x + z = 3y$$

$$(y + 0,2z) \cdot 0,2 + z = 3(34 - 0,6z)$$

$$0,2y + 0,04z + z = 102 - 1,8z$$

$$0,04z + z + 1,8z = 102 - 0,2y$$

$$2,84z = 102 - 0,2(34 - 0,6z)$$

$$2,84z = 102 - 6,8 + 0,12z$$

$$2,84 - 0,12z = 95,2$$

$$z = 95,2$$

$$2,72$$

$$\boxed{z = 35}$$

$$x + y + z = 68$$

$$x + y + 35 = 68$$

$$x + y = 33$$

$$x + 34 - 0,6 \cdot 35 = 33$$

$$x + 34 - 21 = 33$$

$$x = 33 - 13$$

$$\boxed{x = 20}$$

$$x + y + z = 68$$

$$20 + y + 35 = 68$$

$$y = 68 - 55$$

$$\boxed{y = 13}$$

R: Assim, como Coca tem R\$ 35,00 e Ali R\$ 20,00, Ali tem R\$ 95,00 a menos que Coca (A)

05-

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

$$X = \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}$$

$$AX = \begin{bmatrix} 3Y + 4Z \\ X + 5Z \\ 2X + Y \end{bmatrix}$$

$$\begin{cases} 3Y + 4Z = 134 \\ X + 5Z = 115 \\ 2X + Y = 48 \end{cases} \quad \rightarrow \begin{pmatrix} 0 & 3 & 4 & 134 \\ 1 & 0 & 5 & 115 \\ 2 & 1 & 0 & 48 \end{pmatrix}$$

$$6 \rightarrow \begin{pmatrix} -6 & 0 & 4 & -10 \\ 1 & 0 & 5 & 115 \end{pmatrix} \sim \begin{pmatrix} 0 & 0 & 34 & 680 \\ 1 & 0 & 5 & 115 \end{pmatrix}$$

$$\begin{aligned} 34Z &= 680 \\ Z &= 20 \end{aligned}$$

$$X + 5Z = 115$$

$$2X + Y = 48$$

$$X + Y + Z =$$

$$X + 5 \cdot 20 = 115$$

$$2 \cdot 15 + Y = 48$$

$$15 + 18 + 20 = \text{R\$ } 53,00$$

$$X = 115 - 100$$

$$Y = 48 - 30$$

$$X = 15$$

$$Y = 18$$

(A)