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Tarefa Básica I

1.a)  $\begin{cases} 2x - y = 2 \\ -x + 3y = -3 \end{cases}$

$$D = \begin{vmatrix} 2 & -1 \\ -1 & 3 \end{vmatrix} = 6 - 1 = 5 \quad D_x = \begin{vmatrix} 2 & -1 \\ -3 & 3 \end{vmatrix} = 6 - 3 = 3$$

$$D_y = \begin{vmatrix} 2 & 2 \\ -1 & -3 \end{vmatrix} = (-6) - (-2) = -4 \quad x = \frac{3}{5} \quad y = \frac{-4}{5}$$

$$V = \left\{ \left( \frac{3}{5}, \frac{-4}{5} \right) \right\}$$

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

$$D = \begin{vmatrix} 0 & 9 & 4 \\ 3 & -1 & 1 \\ 2 & 0 & 3 \end{vmatrix} \quad \begin{vmatrix} 3 & -1 \\ 2 & 0 \end{vmatrix} = (-10) - 18 = -28$$
  
$$\begin{vmatrix} 4 & 1 & -2 \\ 0 & -12 & 2 \end{vmatrix}$$

$$D_x = \begin{vmatrix} 1 & -1 & 1 \\ -1 & 0 & 3 \\ 7 & 1 & 2 \end{vmatrix} \quad \begin{vmatrix} 1 & -1 \\ -1 & 0 \end{vmatrix} = (-22) - 1 = -23$$
  
$$\begin{vmatrix} 0 & -21 & -1 \\ -4 & 63 & -4 \end{vmatrix}$$

$$D_y = \begin{vmatrix} 3 & 1 & 1 \\ 2 & -1 & 3 \\ 4 & 7 & 2 \end{vmatrix} \quad \begin{vmatrix} 3 & 1 \\ 2 & -1 \end{vmatrix} = 32 - 65 = -33$$
  
$$\begin{vmatrix} 6 & 12 & 14 \end{vmatrix}$$

$$Dz = \begin{vmatrix} 0 & -3 & -14 \\ 3 & -1 & 1 \\ 2 & 0 & -1 \end{vmatrix} = 3(-1) - 2(0) = 6 - (-17) = 23$$

$$\begin{vmatrix} 0 & -3 & -14 \\ 3 & -1 & 1 \\ 4 & 1 & 7 \end{vmatrix} = 4(-1) - 0(-1) = -4$$

$$x = \frac{-23}{-23} = 1 \quad y = \frac{-23}{-23} = 1 \quad z = \frac{23}{-23} = -1$$

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

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

$$D = \begin{vmatrix} 3 & 4 & -1 \\ 4 & 5 & 2 \\ 1 & -2 & 3 \end{vmatrix} = 61 - 31 = 30$$

$$Dy = \begin{vmatrix} 3 & 1 & -1 \\ 4 & 12 & 2 \\ 1 & 8 & 3 \end{vmatrix} = 78 - 48 = 30$$

$$y = \frac{30}{30} \Rightarrow \boxed{y = 1} \quad \boxed{\text{Alternativa A}}$$

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

$$D = \begin{vmatrix} 2 & -33 & -6 \\ 1 & 2 & 1 \\ 3 & 1 & -11 \\ 2 & 3 & -1 \end{vmatrix} \begin{matrix} | \\ | \\ 3 \\ 2 \\ | \\ 2 \\ 3 \\ -1 \\ -44 \\ 9 \end{matrix} = (-36) - (-37) = 1$$

$$D_x = \begin{vmatrix} 1 & -33 & 4 \\ -2 & 1 & -11 \\ 1 & 3 & -1 \end{vmatrix} \begin{matrix} | \\ | \\ -2 \\ 1 \\ | \\ 1 \\ 3 \\ -1 \\ -22 \\ -4 \\ -11 \\ -3 \end{matrix} = (-29) - (-28) = -1$$

$$D_y = \begin{vmatrix} 1 & 1 & 1 \\ 3 & -2 & -11 \\ 2 & 1 & -1 \end{vmatrix} \begin{matrix} | \\ | \\ 3 \\ -2 \\ | \\ 2 \\ 1 \\ 2 \\ -22 \\ 3 \end{matrix} = (-17) - (-18) = 1$$

$$D_z = \begin{vmatrix} 2 & -6 & 6 \\ 1 & 2 & 1 \\ 3 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix} \begin{matrix} | \\ | \\ 3 \\ 1 \\ | \\ 2 \\ 3 \\ 1 \\ -8 \\ 9 \end{matrix} = 2 - 2 = 0$$

$$x = \frac{-1}{1} = -1 \quad y = \frac{1}{1} = 1 \quad z = \frac{0}{1} = 0$$

$$a+b+c = 1 + (-1) + 0 \rightarrow \boxed{a+b+c = 0}$$

[Alternativa C]

$$4. \begin{cases} x + 2y - 3z = 29 \\ x + 3y + 2z = 4 \\ x - y - 2z = 8 \end{cases}$$

$$D = \begin{vmatrix} 1 & 2 & -3 \\ 1 & 3 & 2 \\ 1 & -1 & -2 \end{vmatrix} = 1 - (-15) = 16$$

$$D_x = \begin{vmatrix} 29 & 2 & -3 \\ 4 & 3 & 2 \\ 8 & -1 & -2 \end{vmatrix} = (-30) - (-146) = 16$$

$$D_y = \begin{vmatrix} 1 & 29 & -3 \\ 1 & 4 & 2 \\ 1 & 8 & -2 \end{vmatrix} = 26 - (-54) = 80$$

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

$$x = \frac{16}{16} = 1 \quad y = \frac{80}{16} : 8 = \frac{10}{2} = 5 \quad z = \frac{-96}{16} : 8 = \frac{-12}{2} = -6$$

$$x + y + z = 1 + 5 + (-6) \Rightarrow x + y + z = 0$$

Alternativa A

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

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

$$D_x = \begin{vmatrix} 0 & 10 & 3 \\ 5 & 1 & 0 \\ 3 & 2 & 1 \\ 7 & 2 & 1 \end{vmatrix} \quad 10 \quad 7 = 17 - 13 = 4$$

$$D_y = \begin{vmatrix} 0 & 14 & 0 \\ 2 & 5 & 0 \\ 0 & 3 & 1 \\ 3 & 7 & 1 \end{vmatrix} \quad 14 \quad 0 = 21 - 14 = 7$$

$$D_z = \begin{vmatrix} 30 & 12 & 0 \\ 2 & 1 & 5 \\ 0 & 2 & 3 \\ 3 & 2 & 7 \end{vmatrix} \quad 30 \quad 2 = 37 - 42 = -5$$

$$\boxed{x = \frac{4}{3}} \quad \boxed{y = \frac{7}{3}} \quad \boxed{z = \frac{-5}{3}}$$

Alternativa D

$$6. \begin{vmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & 2 & 2 \end{vmatrix} \cdot \begin{vmatrix} x \\ y \\ z \end{vmatrix} = \begin{vmatrix} 3 \\ 7 \\ -1 \end{vmatrix}$$

$$(1 \cdot x) + (0 \cdot y) + (0 \cdot z) = 3 \rightarrow \boxed{x = 3}$$

$$(2 \cdot x) + (1 \cdot y) + (0 \cdot z) = 7 \rightarrow 6 + y = 7 \rightarrow \boxed{y = 1}$$

$$(-1 \cdot x) + (2 \cdot y) + (2 \cdot z) = -1 \rightarrow (-3) + 2 + 2z = -1 \rightarrow 2z = 0 \rightarrow \boxed{z = 0}$$

[Alternativa E]

### Tarefa Básica II

$$1. \begin{cases} 2x - y - 3z = -5 \\ x + 3y - z = 11 \\ x - 5z = 3 \end{cases}$$

$$\left( \begin{array}{ccc|c} 2 & -1 & -3 & -5 \\ 1 & 3 & -1 & 11 \\ 1 & 0 & -5 & 3 \end{array} \right) \xrightarrow{\begin{matrix} R1 \rightarrow R1 - R2 \\ R2 \rightarrow R2 - R1 \\ R3 \rightarrow R3 - R1 \end{matrix}} \sim \left( \begin{array}{ccc|c} 2 & -1 & -3 & -5 \\ 0 & \frac{7}{2} & \frac{1}{2} & \frac{22}{2} \\ 0 & \frac{1}{2} & \frac{-7}{2} & \frac{11}{2} \end{array} \right) \xrightarrow{\begin{matrix} R2 \rightarrow R2 \cdot \frac{2}{7} \\ R3 \rightarrow R3 - R2 \end{matrix}}$$

$$\left( \begin{array}{ccc|c} 2 & -1 & -3 & -5 \\ 0 & \frac{7}{2} & \frac{1}{2} & \frac{22}{2} \\ 0 & 0 & \frac{-25}{2} & \frac{25}{2} \end{array} \right)$$

$$\frac{-25}{7} \cdot z = \frac{25}{7} \rightarrow z = \frac{25}{7} \cdot \left( -\frac{2}{25} \right) \rightarrow z = \left( -\frac{25}{25} \right) \rightarrow \boxed{z = -1}$$

$$\frac{7}{2} \cdot y + 1 \cdot (-1) = \frac{27}{2} \rightarrow \frac{7}{2} \cdot y = \frac{27}{2} + 1 \rightarrow y = 14 \cdot \frac{2}{7} \rightarrow \boxed{y = 4}$$

$$x - 5 \cdot (-1) = 3 \Rightarrow x = 3 - 5 \Rightarrow \boxed{x = -2}$$

2.  $\begin{cases} x = 2y \\ 2y = 3z \\ x + y + z = 11 \end{cases} \Rightarrow \begin{cases} x - 2y = 0 \\ 2y - 3z = 0 \\ x + y + z = 11 \end{cases}$

$$\left( \begin{array}{ccc|c} 1 & -2 & 0 & 0 \\ 0 & 2 & -3 & 0 \\ 1 & 1 & 1 & 11 \end{array} \right) \xrightarrow{-1} \left( \begin{array}{ccc|c} 1 & -2 & 0 & 0 \\ 0 & 2 & -3 & 0 \\ 0 & 3 & 1 & 11 \end{array} \right) \xrightarrow{\frac{-3}{2}} \left( \begin{array}{ccc|c} 1 & -2 & 0 & 0 \\ 0 & 2 & -3 & 0 \\ 0 & 0 & \frac{1}{2} & 11 \end{array} \right)$$

$$\left( \begin{array}{ccc|c} 1 & -2 & 0 & 0 \\ 0 & 2 & -3 & 0 \\ 0 & 0 & \frac{1}{2} & 11 \end{array} \right)$$

$$\frac{11}{2}, z = 11 \Rightarrow z = 11 \cdot \frac{2}{11} \Rightarrow z = 2$$

$$2y - 3 \cdot 2 = 0 \Rightarrow 2y = 6 \Rightarrow y = 3$$

$$x - 2 \cdot 3 = 0 \Rightarrow x = 6$$

$$x + 2y + 3z = 6 + 6 + 6 \Rightarrow \boxed{x + 2y + 3z = 18}$$

**Alternativa B**

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

$$\left( \begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 2 & -1 & -2 & 1 \\ 0 & 6 & 3 & -12 \end{array} \right) \xrightarrow{-2} \left( \begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 0 & -3 & -4 & 1 \\ 0 & 6 & 3 & -12 \end{array} \right) \xrightarrow[4]{2} \left( \begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 0 & -3 & -4 & 1 \\ 0 & 0 & -5 & -10 \end{array} \right)$$

$$-5z = -10 \Rightarrow z = 2 \quad [\text{Alternative D}]$$

$$4. \begin{cases} x = y + \frac{1}{5} \cdot z \\ 3y = z + \frac{1}{5} \cdot x \\ z + x + y = 68 \end{cases} \rightarrow \begin{cases} x - y - \frac{z}{5} = 0 \\ (-\frac{x}{5}) + 3y - z = 0 \\ x + y + z = 68 \end{cases}$$

$$\left( \begin{array}{ccc|c} 1 & (-1) & (-\frac{1}{5}) & 0 \\ (-\frac{1}{5}) & 3 & (-1) & 0 \\ 1 & 1 & 1 & 68 \end{array} \right) \xrightarrow{\frac{1}{5}} \sim \left( \begin{array}{ccc|c} 1 & (-1) & (-\frac{1}{5}) & 0 \\ 0 & \frac{14}{5} & \frac{4}{5} & 0 \\ 0 & 2 & \frac{6}{5} & 68 \end{array} \right) \xrightarrow{-\frac{5}{2}}$$

$$\left( \begin{array}{ccc|c} 1 & (-1) & (-\frac{1}{5}) & 0 \\ 0 & \frac{14}{5} & \frac{4}{5} & 0 \\ 0 & 0 & \frac{68}{35} & 68 \end{array} \right)$$

$$\frac{68}{35}, z = 68 \rightarrow z = \frac{68}{35} \cdot \frac{35}{68} \rightarrow z = 1$$

$$2y + \frac{6}{5} \cdot 35 = 68 \rightarrow 2y = 68 - 42 \rightarrow 2y = 26 \rightarrow y = 13$$

$$x + 13 + 35 = 68 \rightarrow x = 68 - 48 \rightarrow x = 20$$

$$x \rightarrow A1i = R\$ 20,00$$

$$y \rightarrow B1o = R\$ 13,00$$

$$z \rightarrow Caco = R\$ 35,00$$

[Alternative A]

$$5. \quad A = \begin{vmatrix} 0 & 3 & 4 \\ 1 & 0 & 5 \\ 2 & 1 & 0 \end{vmatrix} \quad x = \begin{vmatrix} x \\ y \\ z \end{vmatrix} \quad A \cdot x = \begin{vmatrix} 134 \\ 115 \\ 48 \end{vmatrix}$$

$$\begin{cases} 3Y + 4Z = 134 \\ X + 5Z = 115 \\ 2X + Y = 48 \end{cases}$$

$$\left( \begin{array}{ccc|c} 0 & 3 & 4 & 134 \\ 1 & 0 & 5 & 115 \\ 2 & 1 & 0 & 48 \end{array} \right) \xrightarrow[-2]{} \left( \begin{array}{ccc|c} 0 & 3 & 4 & 134 \\ 1 & 0 & 5 & 115 \\ 0 & 1 & -10 & -182 \end{array} \right) \xrightarrow[4]{} \left( \begin{array}{ccc|c} 0 & 3 & 4 & 134 \\ 1 & 0 & 5 & 115 \\ 0 & 1 & -10 & -182 \end{array} \right)$$

$$\left( \begin{array}{ccc|c} 0 & 3 & 4 & 134 \\ 1 & 0 & 5 & 115 \\ 0 & 0 & -\frac{34}{3} & -\frac{680}{3} \end{array} \right)$$

$$\left(-\frac{34}{3}\right) \cdot Z = \left(-\frac{680}{3}\right) \Rightarrow Z = \left(-\frac{680}{3}\right) \cdot \left(\frac{3}{34}\right) \Rightarrow Z = \frac{680}{34}$$

$$Z = 20$$

$$Y = 10 \cdot 20 = (-100) \Rightarrow Y = (-182) + 200 \Rightarrow Y = 18$$

$$X + S \cdot 20 = 115 \Rightarrow X = 115 - 100 \Rightarrow X = 15$$

$$20 + 18 + 15 = \boxed{53} \quad \boxed{\text{Alternativa A}}$$