

2ª Lista de Exercícios

b) Moderno: $15 \cdot 5 + 8 \cdot 20 + 5 \cdot 16 + 1 \cdot 7 + 10 \cdot 17 = 490$
 Mediterrâneo: $15 \cdot 7 + 8 \cdot 18 + 5 \cdot 12 + 1 \cdot 9 + 10 \cdot 21 = 528$
 Colonial: $15 \cdot 6 + 8 \cdot 25 + 5 \cdot 8 + 1 \cdot 5 + 10 \cdot 13 = 465$

c) $5 \cdot 490 + 7 \cdot 528 + 12 \cdot 465 = 11.726$

④
$$\begin{cases} 2x - y + 3z = 11 \\ 4x - 3y + 2z = 0 \\ x + y + z = 6 \\ 3x + y + z = 4 \end{cases} \quad \left(\begin{array}{ccc|c} 2 & -1 & 3 & 11 \\ 4 & -3 & 2 & 0 \\ 1 & 1 & 1 & 6 \\ 3 & 1 & 1 & 4 \end{array} \right) \begin{array}{l} L_1 \leftrightarrow L_3 \\ \longleftrightarrow \end{array}$$

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 4 & -3 & 2 & 0 \\ 2 & -1 & 3 & 11 \\ 3 & 1 & 1 & 4 \end{array} \right) \begin{array}{l} L_2 - 4L_1 \\ \longleftrightarrow \\ L_3 - 2L_1 \\ L_4 - 3L_1 \end{array} \left(\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & -7 & -2 & -24 \\ 0 & -3 & 1 & -1 \\ 0 & -2 & -2 & -14 \end{array} \right) \begin{array}{l} \longleftrightarrow \\ L_4 : (-2) \end{array}$$

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & -7 & -2 & -24 \\ 0 & -3 & 1 & -1 \\ 0 & 1 & 1 & 7 \end{array} \right) \begin{array}{l} L_2 \leftrightarrow L_4 \\ \longleftrightarrow \end{array} \left(\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & 1 & 1 & 7 \\ 0 & -3 & 1 & -1 \\ 0 & -7 & -2 & -24 \end{array} \right) \begin{array}{l} L_1 - L_2 \\ \longleftrightarrow \\ L_3 + 3L_2 \\ L_4 + 7L_2 \end{array}$$

$$\left(\begin{array}{ccc|c} 1 & 0 & 0 & -1 \\ 0 & 1 & 1 & 7 \\ 0 & 0 & 4 & 20 \\ 0 & 0 & 9 & 25 \end{array} \right) \rightarrow \text{não há solução}$$

$$(12) \begin{pmatrix} 1 & 1 & 1 & 4 \\ 2 & 5 & -2 & 3 \\ 1 & 7 & -7 & 5 \end{pmatrix} \begin{matrix} \Leftrightarrow \\ L_2 - 2L_1 \\ L_3 - L_1 \end{matrix} \begin{pmatrix} 1 & 1 & 1 & 4 \\ 0 & 3 & -4 & -5 \\ 0 & 6 & -8 & 1 \end{pmatrix} \begin{matrix} \Leftrightarrow \\ \\ L_3 - 2L_2 \end{matrix}$$

$$\begin{pmatrix} 1 & 1 & 1 & 4 \\ 0 & 3 & -4 & -5 \\ 0 & 0 & 0 & 11 \end{pmatrix} \rightarrow \text{sem solu\c{a}\~{o}}$$

$$(13) \begin{pmatrix} 1 & -2 & 3 & 0 \\ 2 & 5 & 6 & 0 \end{pmatrix} \begin{matrix} \Leftrightarrow \\ L_2 - 2L_1 \end{matrix} \begin{pmatrix} 1 & -2 & 3 & 0 \\ 0 & 9 & 0 & 0 \end{pmatrix}$$

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

$$(14) \begin{pmatrix} 1 & 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & -1 & 4 \\ 1 & 1 & -1 & 1 & -4 \\ 1 & -1 & 1 & 1 & 2 \end{pmatrix} \begin{matrix} \Leftrightarrow \\ L_2 - L_1 \\ L_3 - L_1 \\ L_4 - L_1 \end{matrix} \begin{pmatrix} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -2 & 4 \\ 0 & 0 & -2 & 0 & -4 \\ 0 & -2 & 0 & 0 & 2 \end{pmatrix} \Leftrightarrow$$

$$\begin{cases} x_1 = 1 \\ x_4 = -2 \\ x_3 = 2 \\ x_2 = -1 \end{cases}$$

$$(15) \begin{pmatrix} 1 & 2 & 3 & 0 \\ 2 & 1 & 3 & 0 \\ 3 & 2 & 1 & 0 \end{pmatrix} \begin{matrix} \Leftrightarrow \\ L_2 - 2L_1 \\ L_3 - 3L_1 \end{matrix} \begin{pmatrix} 1 & 2 & 3 & 0 \\ 0 & -3 & -3 & 0 \\ 0 & -4 & -8 & 0 \end{pmatrix} \begin{matrix} \Leftrightarrow \\ L_2 : (-3) \\ L_3 : (-4) \end{matrix}$$

$$\begin{pmatrix} 1 & 2 & 3 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 2 & 0 \end{pmatrix} \begin{matrix} L_1 - 2L_2 \\ \\ L_3 - L_2 \end{matrix} \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \Leftrightarrow \begin{cases} x = 0 \\ y = 0 \\ z = 0 \end{cases}$$

(15)

$$b) \det(A) = 3 \cdot 18 \cdot (-5) \cdot 0 \cdot (-1) = 0$$

(16)

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

$$A = \begin{pmatrix} 1 & -2 & 1 \\ 2 & 1 & 0 \\ 0 & 1 & -5 \end{pmatrix}$$

$$\det(A) = \begin{vmatrix} 1 & -2 & 1 & 1 & -2 \\ 2 & 1 & 0 & 3 & 1 \\ 0 & 1 & -5 & 0 & 1 \end{vmatrix}$$

$$= (-5 + 0 + 2) - (0 + 0 + 20)$$

$$= -3 - 20 = -23$$

$$A_x = \begin{pmatrix} 1 & -2 & 1 \\ 3 & 1 & 0 \\ 4 & 1 & -5 \end{pmatrix}$$

$$\det(A_x) = \begin{vmatrix} 1 & -2 & 1 & 1 & -2 \\ 3 & 1 & 0 & 3 & 1 \\ 4 & 1 & -5 & 0 & 1 \end{vmatrix}$$

$$= (-5 + 0 + 3) - (4 + 0 + 30)$$

$$= -2 - 34 = -36$$

$$A_y = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 3 & 0 \\ 0 & 4 & -5 \end{pmatrix}$$

$$\det(A_y) = \begin{vmatrix} 1 & 1 & 1 & 1 & 1 \\ 2 & 3 & 0 & 2 & 3 \\ 0 & 4 & -5 & 0 & 4 \end{vmatrix}$$

$$= (-15 + 0 + 8) - (0 + 0 - 10)$$

$$= 3$$

$$A_z = \begin{pmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \\ 0 & 1 & 4 \end{pmatrix} \det(A_z) = \begin{vmatrix} 1 & -2 & 1 & | & 1 & -2 \\ 2 & 1 & 3 & | & 2 & 1 \\ 0 & 1 & 4 & | & 0 & 1 \end{vmatrix}$$

$$= (4 + 0 + 2) - (0 + 3 - 16)$$

$$= 19$$

$$x = \frac{36}{23}, \quad y = \frac{-3}{23}, \quad z = \frac{-19}{23}$$