Lista 4 - Geometria Analítica

Letícia Santos Alves RA: 2025.1.08.016

01-A) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -1 \end{bmatrix} \rightarrow x_1 = 2$, $x_2 = -1$ $(2, -1)$

B) $\begin{bmatrix} 1 & 0 & 0 & 0 & 4 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix} \rightarrow x_1 = 4$, $x_3 = 2$, $x_2 = 3$, $x_4 = 1$ $(4, 3, 2, 1)$

C) $\begin{bmatrix} 1 & 0 & 0 & 0 & 6 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 1 & 1 & 2 \end{bmatrix} \rightarrow x_1 = 6$, $x_3 = 2 - x_4$, $x_2 = 3$ $(6, 3, 2 - x_4, x_4)$

O x_4 é livre.

d) $\begin{bmatrix} 1 & 0 & 3 & 1 \\ 0 & 1 & -1 & 2 \end{bmatrix} \rightarrow x_1 = 1 - 3x_3$, $x_2 = 2 - (-x_3)$ $(1 - 3x_3, 2 + x_3, x_3)$

e) $\begin{bmatrix} 1 & 0 & 0 & -7 & 8 \\ 0 & 1 & 0 & 3 & 2 \\ 0 & 0 & 1 & 1 & -5 \end{bmatrix} \rightarrow x_1 = 8 - (-7x_4)$, $x_2 = 2 - 3x_4$, $x_3 = -5 - x_4$ $(8 + 7x_4, 2 - 3x_4, -5 - x_4, x_4)$

f) $\begin{bmatrix} 1 & -6 & 0 & 0 & 3 & -2 \\ 0 & 0 & 1 & 0 & 4 & 7 \\ 0 & 0 & 0 & 1 & 5 & 8 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \rightarrow x_1 = -2 - (-6x_2) - 3x_5$, $x_3 = 7 - 4x_5$, $x_4 = 8 - 5x_5$ $(-2 + 6x_2 - 3x_5, x_2, 7 - 4x_5, 8 - 5x_5, x_5)$

02-A) $\begin{bmatrix} 3 & -4 & 1 \\ 1 & 3 & 9 \end{bmatrix} \rightarrow l_1 \leftrightarrow l_2 \rightarrow \begin{bmatrix} 1 & 3 & 9 \\ 3 & -4 & 1 \end{bmatrix} \rightarrow l_2 = l_2 - 3l_1 \rightarrow \begin{bmatrix} 1 & 3 & 9 \\ 0 & -13 & -26 \end{bmatrix} \rightarrow l_2 = l_2 \div -13 \rightarrow$

$\begin{bmatrix} 1 & 3 & 9 \\ 0 & 1 & 2 \end{bmatrix} \rightarrow l_1 = l_1 - 3l_2 \rightarrow \begin{bmatrix} 1 & 0 & 3 \\ 0 & 1 & 2 \end{bmatrix} \rightarrow x = 3$, $y = 2$

B) $\begin{bmatrix} 5 & 8 & 5 \\ 10 & 16 & -4 \end{bmatrix} \rightarrow l_1 \leftrightarrow l_2 = \begin{bmatrix} 10 & 16 & -4 \\ 5 & 8 & 5 \end{bmatrix} \rightarrow l_1 \leftarrow l_1 \div 10 = \begin{bmatrix} 1 & 1{,}6 & -\frac{4}{10} \\ 5 & 8 & 5 \end{bmatrix} \rightarrow l_2 \leftarrow l_2 - 5l_1 \rightarrow$

$\begin{bmatrix} 1 & 1{,}6 & \frac{4}{10} \\ 0 & 0 & 2 \end{bmatrix} \rightarrow$ Esse sistema é impossível

C) $\begin{bmatrix} 1 & 2 & 5 \\ 2 & -3 & -4 \end{bmatrix} \rightarrow l_2 \leftarrow l_2 - 2l_1 = \begin{bmatrix} 1 & 2 & 5 \\ 0 & -7 & -14 \end{bmatrix} \rightarrow l_2 \leftarrow l_2 \div -7 = \begin{bmatrix} 1 & 2 & 5 \\ 0 & 1 & 2 \end{bmatrix} \rightarrow l_1 \leftarrow l_1 - 2l_2 = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \end{bmatrix}$ $x = 1$, $y = 2$

d) $\begin{bmatrix} 3 & 2 & -5 & 8 \\ 2 & -4 & -2 & -4 \\ 1 & -2 & -3 & -4 \end{bmatrix} \ell_1 \leftrightarrow \ell_3 = \begin{bmatrix} 1 & -2 & -3 & -4 \\ 2 & -4 & -2 & -4 \\ 3 & 2 & -5 & 8 \end{bmatrix} \to \ell_2 \leftarrow \ell_2 - 2\ell_1 = \begin{bmatrix} 1 & -2 & -3 & -4 \\ 0 & 0 & 4 & 4 \\ 3 & 2 & -5 & 8 \end{bmatrix} \to \ell_3 \leftarrow \ell_3 - 3\ell_1 \to$

$\begin{bmatrix} 1 & -2 & -3 & -4 \\ 0 & 0 & 4 & 4 \\ 0 & 8 & 4 & 20 \end{bmatrix} \to \ell_2 \leftrightarrow \ell_3 = \begin{bmatrix} 1 & -2 & -3 & -4 \\ 0 & 8 & 4 & 4 \\ 0 & 0 & 4 & 4 \end{bmatrix} \to \ell_2 \leftarrow \ell_2 \div 8 = \begin{bmatrix} 1 & -2 & -3 & -4 \\ 0 & 1 & 0{,}5 & 0{,}5 \\ 0 & 0 & 4 & 4 \end{bmatrix} \to \ell_3 \leftarrow \ell_3 \div 4 =$

$\begin{bmatrix} 1 & -2 & -3 & -4 \\ 0 & 1 & 0{,}5 & 0{,}5 \\ 0 & 0 & 1 & 1 \end{bmatrix} \to \ell_2 \leftarrow \ell_2 + \frac{1}{2}\ell_3 = \begin{bmatrix} 1 & -2 & -3 & -4 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix} \to \ell_1 \leftarrow \ell_1 + 2\ell_2 = \begin{bmatrix} 1 & 0 & -1 & -2 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix} \to \ell_2 \leftarrow \ell_2 - \ell_3 =$

$\begin{bmatrix} 1 & 0 & -1 & -2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix} \to \ell_1 \leftarrow \ell_1 + \ell_3 = \begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix} \to x = -1,, \quad y = 0,, \quad z = 1,,$

e) $\begin{bmatrix} 2 & -6 & -4 \\ 1 & 3 & 1 \\ 4 & 12 & 2 \end{bmatrix} \ell_1 \leftrightarrow \ell_2 = \begin{bmatrix} 1 & 3 & 1 \\ 2 & -6 & -4 \\ 4 & 12 & 2 \end{bmatrix} \to \begin{matrix} \ell_2 \leftarrow \ell_2 - 2\ell_1 \\ \ell_3 \leftarrow \ell_3 - 4\ell_1 \end{matrix} = \begin{bmatrix} 1 & 3 & 1 \\ 0 & -12 & -6 \\ 0 & 0 & -2 \end{bmatrix} \ell_2 = \ell_2 \div -12 = \begin{bmatrix} 1 & 3 & 1 \\ 0 & 1 & 0{,}5 \\ 0 & 0 & -2 \end{bmatrix} \begin{matrix} \ell_1 = \\ \ell_1 - 3\ell_2 \end{matrix}$

$\begin{bmatrix} 1 & 0 & -0{,}5 \\ 0 & 1 & 0{,}5 \\ 0 & 0 & -2 \end{bmatrix} \to \ell_3 = \ell_3 \div -2 = \begin{bmatrix} 1 & 0 & -0{,}5 \\ 0 & 1 & 0{,}5 \\ 0 & 0 & 1 \end{bmatrix} \to x = -0{,}5,, \quad y = 0{,}5,,$

$0x + 0y = 1 \to 0 = 1$, Sem solução,,

f) $\begin{bmatrix} 1 & 2 & -1 & 2 \\ 2 & -1 & 3 & 9 \\ 3 & 3 & -2 & 3 \end{bmatrix} \begin{matrix} \ell_2 \leftarrow \ell_2 - 2\ell_1 \\ \ell_3 \leftarrow \ell_3 - 3\ell_1 \end{matrix} = \begin{bmatrix} 1 & 2 & -1 & 2 \\ 0 & -5 & 5 & 5 \\ 0 & -3 & 1 & -3 \end{bmatrix} \ell_2 \leftarrow \ell_2 \div -5 = \begin{bmatrix} 1 & 2 & -1 & 2 \\ 0 & 1 & -1 & -1 \\ 0 & -3 & 1 & -3 \end{bmatrix} \begin{matrix} \ell_1 \leftarrow \ell_1 - 2\ell_2 \\ \ell_3 \leftarrow \ell_3 + 3\ell_2 \end{matrix}$

$\begin{bmatrix} 1 & 0 & 1 & 4 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & -2 & -6 \end{bmatrix} \ell_3 \leftarrow \ell_3 \div -2 = \begin{bmatrix} 1 & 0 & 1 & 4 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{matrix} \ell_1 \leftarrow \ell_1 - \ell_3 \\ \ell_2 \leftarrow \ell_2 + \ell_3 \end{matrix} \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{matrix} x = 1,, & y = 2,, \\ z = 3,, & \end{matrix}$

G) $\begin{bmatrix} 1 & 0 & 3 & -8 \\ 2 & -4 & 0 & -4 \\ 3 & -2 & -5 & 26 \end{bmatrix} \begin{matrix} \ell_2 \leftarrow \ell_2 - 2\ell_1 \\ \ell_3 \leftarrow \ell_3 - 3\ell_1 \end{matrix} = \begin{bmatrix} 1 & 0 & 3 & -8 \\ 0 & -4 & -6 & 12 \\ 0 & -2 & -14 & 50 \end{bmatrix} \ell_2 \leftarrow \ell_2 \div -4 = \begin{bmatrix} 1 & 0 & 3 & -8 \\ 0 & 1 & 1{,}5 & -3 \\ 0 & -2 & -14 & 50 \end{bmatrix} \ell_3 \leftarrow \ell_3 + 2\ell_2$

$$\begin{bmatrix} 1 & 0 & 3 & -8 \\ 0 & 1 & 1{,}5 & -3 \\ 0 & 0 & -11 & 44 \end{bmatrix} \ell_3 \leftarrow \ell_3 \div -11 = \begin{bmatrix} 1 & 0 & 3 & -8 \\ 0 & 1 & 1{,}5 & -3 \\ 0 & 0 & 1 & -4 \end{bmatrix} \begin{matrix} \ell_1 \leftarrow \ell_1 - 3\ell_3 = \\ \ell_2 \leftarrow \ell_2 - 1{,}5\ell_3 \end{matrix} \begin{bmatrix} 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & -4 \end{bmatrix}$$

$x = 4$, $y = 3$, $z = -4$

h) $$\begin{bmatrix} 1 & 2 & 3 & 10 \\ 3 & 4 & 6 & 23 \\ 2 & 2 & 3 & 13 \end{bmatrix} \begin{matrix} \ell_2 \leftarrow \ell_2 - 3\ell_1 = \\ \ell_3 \leftarrow \ell_3 - 2\ell_1 \end{matrix} \begin{bmatrix} 1 & 2 & 3 & 10 \\ 0 & -2 & -3 & -7 \\ 0 & -2 & -3 & -7 \end{bmatrix} \begin{matrix} \ell_2 \leftarrow \ell_2 \div -2 = \\ \ell_3 \leftarrow \ell_3 - \ell_2 \end{matrix} \begin{bmatrix} 1 & 2 & 3 & 10 \\ 0 & 1 & 1{,}5 & 3{,}5 \\ 0 & 0 & 0 & 0 \end{bmatrix} \ell_1 \leftarrow \ell_1 - 2\ell_2 \rightarrow$$

$$\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 1{,}5 & 3{,}5 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$x = 3$, $y = 3{,}5$, $z =$ variável livre

f) $$\begin{bmatrix} 1 & -3 & 4 & -1 & 2 \\ 2 & -1 & 3 & -2 & 19 \end{bmatrix} \ell_2 \leftarrow \ell_2 - 2\ell_1 = \begin{bmatrix} 1 & -3 & 4 & -1 & 2 \\ 0 & 5 & -5 & 0 & 15 \end{bmatrix} \ell_2 \leftarrow \ell_2 \div 5 = \begin{bmatrix} 1 & -3 & 4 & -1 & 2 \\ 0 & 1 & -1 & 0 & 3 \end{bmatrix} \ell_1 \leftarrow \ell_1 + 3\ell_2$$

$$\begin{bmatrix} 1 & 0 & 1 & -1 & 11 \\ 0 & 1 & -1 & 0 & 3 \end{bmatrix}$$

$x = 11 - z + w$, $y = 3 + z$, z e w são variáveis livres.

02-a) $$\begin{bmatrix} 1 & 2 & 3 & 1 & 8 \\ 1 & 3 & 0 & 1 & 7 \\ 1 & 0 & 2 & 1 & 3 \end{bmatrix} \ell_1 \leftrightarrow \ell_3 = \begin{bmatrix} 1 & 0 & 2 & 1 & 3 \\ 1 & 3 & 0 & 1 & 7 \\ 1 & 2 & 3 & 1 & 8 \end{bmatrix} \begin{matrix} \ell_2 = \ell_2 - \ell_3 = \\ \ell_3 = \ell_3 - \ell_1 \end{matrix} \begin{bmatrix} 1 & 0 & 2 & 1 & 3 \\ 0 & 1 & -3 & 0 & -1 \\ 0 & 2 & 1 & 0 & 5 \end{bmatrix} \ell_3 \leftarrow \ell_3 - 2\ell_2$$

$$\begin{bmatrix} 1 & 0 & 2 & 1 & 3 \\ 0 & 1 & -3 & 0 & -1 \\ 0 & 0 & 7 & 0 & 7 \end{bmatrix} \ell_3 \leftarrow \ell_3 \div 7 = \begin{bmatrix} 1 & 0 & 2 & 1 & 3 \\ 0 & 1 & -3 & 0 & -1 \\ 0 & 0 & 1 & 0 & 1 \end{bmatrix} \begin{matrix} \ell_1 \leftarrow \ell_1 - 2\ell_3 = \\ \ell_2 \leftarrow \ell_2 + 3\ell_3 \end{matrix} \begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 2 \\ 0 & 0 & 1 & 0 & 1 \end{bmatrix}$$

$x_1 = 1 - x_4$ $\quad x_2 = 2$

$x_3 = 1$ $\quad x_4 = x_4$

b) $$\begin{bmatrix} 1 & 1 & 3 & -3 & 0 \\ 0 & 2 & 1 & -3 & 3 \\ 1 & 0 & 2 & -1 & -1 \end{bmatrix} \ell_1 \leftrightarrow \ell_3 = \begin{bmatrix} 1 & 0 & 2 & -1 & -1 \\ 0 & 2 & 1 & -3 & 3 \\ 1 & 1 & 3 & -3 & 0 \end{bmatrix} \ell_3 \leftarrow \ell_3 - \ell_1 = \begin{bmatrix} 1 & 0 & 2 & -1 & -1 \\ 0 & 2 & 1 & -3 & 3 \\ 0 & 1 & 1 & -2 & 1 \end{bmatrix} \ell_2 \leftarrow \ell_2 - \ell_3 = \begin{bmatrix} 1 & 0 & 2 & -1 & -1 \\ 0 & 1 & 0 & -1 & 2 \\ 0 & 1 & 1 & -2 & 1 \end{bmatrix}$$

$$\ell_3 \leftarrow \ell_3 - \ell_2 = \begin{bmatrix} 1 & 0 & 2 & -1 & -1 \\ 0 & 1 & 0 & -1 & 2 \\ 0 & 0 & 1 & -1 & -1 \end{bmatrix} \ell_1 \leftarrow \ell_1 - 2\ell_3 = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & -1 & 2 \\ 0 & 0 & 1 & -1 & -1 \end{bmatrix}$$

$x_1 = 1 - x_4$ $\quad x_2 = 2 - x_4$

$x_3 = -1 - x_4$ $\quad x_4 = x_4$

C) $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 2 & 0 \\ 1 & 3 & 3 & 0 \end{bmatrix} \rightarrow x = 0,, \quad y = 0,, \quad z = 0,, \rightarrow$ solução trivial

04-A) $\begin{bmatrix} 1 & -2 & 1 & 1 & 2 \\ 2 & -5 & 1 & -2 & -1 \\ 3 & -7 & 2 & -1 & 2 \end{bmatrix} \begin{matrix} \ell_2 \leftarrow \ell_2 - 2\ell_1 \\ \ell_3 \leftarrow \ell_3 - 3\ell_1 \end{matrix} = \begin{bmatrix} 1 & -2 & 1 & 1 & 2 \\ 0 & -1 & -1 & -4 & -5 \\ 0 & -1 & -1 & -4 & -4 \end{bmatrix} \ell_3 \leftarrow \ell_3 - \ell_2 = \begin{bmatrix} 1 & -2 & 1 & 1 & 2 \\ 0 & -1 & -1 & -4 & -5 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

O sistema B não é possível $0x + 0y + 0z = 1$

$\begin{bmatrix} 1 & -2 & 1 & 1 \\ 2 & -5 & 1 & -2 \\ 3 & -7 & 2 & -1 \end{bmatrix} \begin{matrix} \ell_2 \leftarrow \ell_2 - 2\ell_1 \\ \ell_3 \leftarrow \ell_3 - 3\ell_1 \end{matrix} = \begin{bmatrix} 1 & -2 & 1 & 1 \\ 0 & -1 & -1 & -4 \\ 0 & -1 & -1 & -4 \end{bmatrix} \ell_3 \leftarrow \ell_3 - \ell_2 = \begin{bmatrix} 1 & -2 & 1 & 1 \\ 0 & -1 & -1 & -4 \\ 0 & 0 & 0 & 0 \end{bmatrix} \ell_2 \cdot (-1)$

$\ell_1 \leftarrow \ell_1 + 2\ell_2 = \begin{bmatrix} 1 & 0 & 3 & 9 \\ 0 & 1 & 1 & 4 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad x_1 = 9 - 3x_3,, \quad x_2 = 4 - x_3,, \quad x_3 = x_3,,$

05-A) $\begin{bmatrix} 1 & 0 & 5 \\ 1 & 1 & 1 \\ 0 & 1 & -4 \end{bmatrix} + 4I = \begin{bmatrix} 5 & 0 & 5 \\ 1 & 5 & 1 \\ 0 & 1 & 0 \end{bmatrix} \times \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \begin{bmatrix} 5 & 0 & 5 & 0 \\ 1 & 5 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \begin{matrix} \ell_1 \leftarrow \ell_1 \div 5 \\ \ell_2 \leftrightarrow \ell_3 \end{matrix} =$

$\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 5 & 1 & 0 \end{bmatrix} \ell_3 \leftarrow \ell_3 - \ell_1 = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 5 & 0 & 0 \end{bmatrix} \ell_3 \leftarrow \ell_3 - 5\ell_2 = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad x_1 = 0 - x_3,, \quad x_2 = 0,, \quad x_3 = x_3,,$

B) $(A - 2I)X = 0 \begin{bmatrix} -1 & 0 & 5 \\ 1 & -1 & 1 \\ 0 & 1 & -6 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \begin{matrix} \ell_1 \leftarrow \ell_1 + 2\ell_2 \\ \ell_2 \leftarrow -\ell_7 \end{matrix} = \begin{bmatrix} 1 & -2 & 7 & 0 \\ 0 & 1 & -6 & 0 \\ 1 & -1 & 1 & 0 \end{bmatrix} \ell_3 \leftarrow \ell_3 - \ell_1 = \begin{bmatrix} 1 & -2 & 7 & 0 \\ 0 & 1 & -6 & 0 \\ 0 & -1 & -6 & 0 \end{bmatrix} \ell_3 = \ell_3 - \ell_2$

$\begin{bmatrix} 1 & -2 & 7 & 0 \\ 0 & 1 & -6 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \ell_1 = \ell_1 + 2\ell_2 = \begin{bmatrix} 1 & 0 & -5 & 0 \\ 0 & 1 & -6 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \rightarrow x_1 = 0 - x_3,, \quad x_2 = 0 - x_3,, \quad x_3 = x_3,,$

06- A) $\begin{bmatrix} 1 & 1 & 1 & 2 \\ 2 & 3 & 2 & 5 \\ 2 & 3 & a^2-1 & a+1 \end{bmatrix} \begin{matrix} l_2 \leftarrow l_2 - 2l_1 \\ l_3 \leftarrow l_3 - 2l_1 \end{matrix} = \begin{bmatrix} 1 & 1 & 1 & 2 \\ 0 & 1 & 0 & 1 \\ 0 & 1 & a^2-3 & a-3 \end{bmatrix} l_3 \leftarrow l_3 - l_2 = \begin{bmatrix} 1 & 1 & 1 & 2 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & a^2-3 & a-3 \end{bmatrix}$ $0x + 0y + (a^2-3) = a-4 \rightarrow$

$a^2-3 \neq 0 \rightarrow a \neq \sqrt{3}$ → solução única || $a = \pm\sqrt{3}$ e $a = 4$ → sem infinitas soluções

$a = \pm\sqrt{3}$ → $a \neq 4$ → nenhuma solução

B) $\begin{bmatrix} 1 & 2 & -3 & 4 \\ 3 & -1 & 5 & 2 \\ 4 & 1 & (a^2-14) & a+2 \end{bmatrix} \begin{matrix} l_2 \leftarrow l_2 - 3l_1 \\ l_3 \leftarrow l_3 - 4l_1 \end{matrix} = \begin{bmatrix} 1 & 2 & -3 & 4 \\ 0 & -7 & 14 & 10 \\ 0 & -7 & a^2-2 & a-14 \end{bmatrix} l_3 \leftarrow l_3 - l_2 = \begin{bmatrix} 1 & 2 & -3 & 4 \\ 0 & -7 & 14 & 10 \\ 0 & 0 & a^2-16 & a-4 \end{bmatrix} \rightarrow$

$0x + 0y + (a^2-16) = a-4 \rightarrow a^2 \neq 16 \rightarrow a \neq 4$ → solução única || $a = \pm 4$ e $a-4=0$ →
$a = 4$ → infinitas soluções || $a = -4$ → nenhuma solução

07- A) $\begin{bmatrix} 2 & -2 & 1 & 0 \\ 3 & 1 & 0 & 1 \end{bmatrix} l_1 \leftarrow l_1 \div 2 = \begin{bmatrix} 1 & -1 & 0,5 & 0 \\ 3 & 1 & 0 & 1 \end{bmatrix} l_3 \leftarrow l_3 - 3l_1 = \begin{bmatrix} 1 & -1 & 0,5 & 0 \\ 0 & 4 & -1,5 & 0 & 1 \end{bmatrix} l_2 \leftarrow l_2 \div 4 =$

$\begin{bmatrix} 1 & -1 & 0,5 & 0 \\ 0 & 1 & -0,375 & 0,25 \end{bmatrix} l_1 \leftarrow l_1 + l_2 = \begin{bmatrix} 1 & 0 & 0,125 & 0,25 \\ 1 & 0 & -0,375 & 0,25 \end{bmatrix} \rightarrow A^{-1} = \begin{bmatrix} 1/8 & 1/4 \\ -3/8 & 1/4 \end{bmatrix}$

B) $\begin{bmatrix} 2 & -2 & 0 & 1 & 0 & 0 \\ 1 & 2 & 1 & 0 & 1 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 \end{bmatrix} l_1 \leftarrow l_1 \div 2 = \begin{bmatrix} 1 & -1 & 0 & 0,5 & 0 & 0 \\ 1 & 2 & 1 & 0 & 1 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 \end{bmatrix} l_2 \leftarrow l_2 - l_1 = \begin{bmatrix} 1 & -1 & 0 & 0,5 & 0 & 0 \\ 0 & 3 & 1 & -0,5 & 1 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 \end{bmatrix} l_2 \div l_2 \div 3 =$

$\begin{bmatrix} 1 & -1 & 0 & 0,5 & 0 & 0 \\ 0 & 1 & 1/3 & -1/6 & 1/3 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 \end{bmatrix} \begin{matrix} l_1 \leftarrow l_1 + l_2 \\ l_3 \leftarrow l_3 - l_2 \end{matrix} = \begin{bmatrix} 1 & 0 & 1/3 & 1/3 & 1/3 & 0 \\ 0 & 1 & 1/3 & -1/6 & 1/3 & 0 \\ 0 & 0 & -4/3 & 1/6 & -1/3 & 1 \end{bmatrix} l_3 \leftarrow l_3 \div (-4/3) = \begin{bmatrix} 1 & 0 & 1/3 & 1/3 & 1/3 & 0 \\ 0 & 1 & 1/3 & -1/6 & 1/3 & 0 \\ 0 & 0 & 1 & -1/8 & 1/4 & -3/4 \end{bmatrix} l_1 \leftarrow l_1 - \frac{1}{3} l_3$

$B^{-1} = \begin{bmatrix} 5/12 & 1/4 & 1/4 \\ -1/8 & 1/4 & 1/4 \\ -1/8 & 1/4 & -3/4 \end{bmatrix}$

C) $\begin{bmatrix} 3 & 5 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{bmatrix} l_1 \Leftrightarrow l_2 = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 3 & 5 & 1 & 0 \end{bmatrix} l_3 \leftarrow l_3 - 3l_1 \begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & 1 & -1 & 1 \end{bmatrix} l_1 \leftarrow l_1 - 2l_2 = \begin{bmatrix} 1 & 0 & -2 & -5 \\ 0 & 1 & -1 & 3 \end{bmatrix} = C^{-1}$

D) $\begin{bmatrix} 0 & -1 & 1 & 1 & 0 & 0 \\ 2 & 0 & -1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{matrix} l_1 \Leftrightarrow l_2 \\ l_1 \leftarrow l_1 \div 2 \\ l_3 \leftarrow l_3 - l_1 \end{matrix} = \begin{bmatrix} 1 & 0 & -0,5 & 0 & 0,5 & 0 \\ 0 & -1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0,5 & 0 & -0,5 & 1 \end{bmatrix} \begin{matrix} l_2 \leftarrow l_2 \cdot (-1) \\ l_3 \leftarrow l_3 - l_2 \\ l_3 \leftarrow l_3 \div 1,5 \end{matrix} = \begin{bmatrix} 1 & 0 & -0,5 & 0 & 0,5 & 0 \\ 0 & 1 & -1 & -1 & 0 & 0 \\ 0 & 0 & 1 & 2/3 & -1/3 & 2/3 \end{bmatrix}$

tilibra

$l_1 \leftarrow l_1 + \frac{1}{2} l_3$
$l_2 \leftarrow l_2 + l_3$

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \\ 0 & 1 & 0 & -\frac{1}{3} & -\frac{1}{3} & \frac{2}{3} \\ 0 & 0 & 1 & \frac{2}{3} & -\frac{1}{3} & \frac{2}{3} \end{array}\right] \rightarrow D^{-1} = \begin{bmatrix} \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \\ -\frac{1}{3} & -\frac{1}{3} & \frac{2}{3} \\ \frac{2}{3} & -\frac{1}{3} & \frac{2}{3} \end{bmatrix}_{//}$$

6) $$\begin{bmatrix} 2 & -1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & -1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 2 & 3 & 0 & 0 & 1 & 0 \\ 0 & 0 & -2 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$ $l_1 \leftarrow l_1 \div 2$, $l_3 \leftarrow l_3 - l_1$ $= \begin{bmatrix} 1 & -0{,}5 & 0 & 0{,}5 & 0{,}5 & 0 & 0 & 0 \\ 0 & 2 & 0 & -1 & 0 & 1 & 0 & 0 \\ 0 & 0{,}5 & 2 & 2{,}5 & 0 & 0 & 1 & 0 \\ 0 & 0 & -2 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$ $l_2 \leftarrow l_2 \div 2 \rightarrow$ $l_1 \leftarrow l_1 + 0{,}5 l_2$, $l_3 \leftarrow l_3 - 0{,}5 l_2$

$$\begin{bmatrix} 1 & 0 & 0 & 0{,}25 \\ 0 & 1 & 0 & -0{,}5 \\ 0 & 0 & 2 & 2{,}75 \\ 0 & 0 & -2 & 0 \end{bmatrix}$$ $l_3 \leftarrow l_3 \div 2$ $= E^{-1} = \begin{bmatrix} \frac{3}{4} & -\frac{1}{4} & \frac{3}{8} & \frac{1}{8} \\ \frac{3}{4} & \frac{1}{4} & \frac{3}{8} & \frac{1}{8} \\ 0 & 0 & 0 & -\frac{1}{2} \\ 0 & 0 & -\frac{1}{4} & 0 \end{bmatrix}_{//}$

Cansei vou fazer no excel

08- $\begin{cases} x + 2y + 3z = 26 \\ 2x + 5y + 6z = 60 \\ 2x + 3y + 4z = 40 \end{cases}$ $\rightarrow 0{,}5y = 4 \rightarrow y = 8_{//} \rightarrow x = 26 - 16 - 3z \rightarrow x = 10 - 3z \rightarrow$ $2(10-3z) + 3 \cdot 8 + 4z = 40 \rightarrow 20 - 6z + 24 + 4z = 40 \rightarrow$ $-2z = 40 - 44 \rightarrow z = \frac{-4}{-2} \rightarrow z = 2_{//} \rightarrow x = 26 - 16 - 6 \rightarrow$
$x = 4_{//}$ Calça = R\$ 4,00 ,, Shorts = R\$ 8,00 ,, Blusa = R\$ 2,00 ,,

09- $\begin{cases} 5x + 2y + 6z = 2200 \\ y = 3z \\ y = z + x \end{cases}$ $\rightarrow 3z = z + x \rightarrow 2z = x \rightarrow 5 \cdot (2z) + 2(3z) + 6z = 2200 \rightarrow$ $10z + 6z + 6z = 2200 \rightarrow 22z = 2200 \rightarrow z = 100$
Sundae = 200 ,, Casquinha = 300 ,, Banana = 100 ,,

10- $\begin{cases} 40t + 30s + 10p = 7000 \\ 20t + 40s + 30p = 6000 \\ 10t + 20s + 40p = 5000 \end{cases}$ $\rightarrow (t + 2s + 4p = 500) \times 2 = (2t + 4s + 8p = 1000) \rightarrow$ $(2t + 4s + 3p = 6000) - (2t + 4s + 8p = 1000) = (-5p = -4000) \rightarrow p = \frac{4000}{5} \rightarrow p = 80_{//} \rightarrow$
$\begin{cases} 4t + 3s = 620 \\ 2t + 4s = 360 \end{cases}$ $\rightarrow (2t + 4s = 360)x = (4t + 8s = 720) \rightarrow (4t + 3s = 320) - (4t + 8s = 720) \rightarrow$ $-5s = 100 \rightarrow s = 20 \rightarrow 2t = 360 - 80 \rightarrow 2t = 280 \rightarrow T = 140_{//}$
Torta de carne = R\$ 140,00 ,, Salada = R\$ 20,00 ,, Pizza = R\$ 80,00 ,,

11- $\begin{cases} 2a + 3b + c = 8400 \\ a + 2b + 2c = 7940 \\ 4a + 3b = 8110 \end{cases}$ $\rightarrow a = \frac{8110 - 3b}{4} \rightarrow 2 \cdot \left(\frac{8110 - 3b}{4}\right) + 3b + c = 8400 \rightarrow \left(\frac{8110 - 3b}{2}\right)$ $+ 3b + c = 8400 \rightarrow 8110 - 3b + 6b + 2c = 16800 \rightarrow$ $3b + 2c = 8730_{//} \rightarrow \left(\frac{8110 - 3b}{4}\right) + 2b + 2c = 7940 \rightarrow 8110 - 3b$ $+ 8b + 8c = 31760 \rightarrow 5b + 8c = 23650_{//}$

$$\begin{cases} 3b+2c=8730 \rightarrow (3b+2c=8730)\times 4=(12b+8c=34920) \rightarrow (5b+8c=23650) - \\ 5b+8c=23650 \quad (12b+8c=34920) \rightarrow (-7b=-11270) \rightarrow b=1610 \end{cases}$$

$3.(1610)+2c=8730 \rightarrow 2c=3900 \rightarrow c=1950$, $a=\left(\frac{8110-3.(1610)}{4}\right) \rightarrow a=\left(\frac{8110-4830}{4}\right)$

$a=\left(\frac{3280}{4}\right) \rightarrow a=820$, $A=820$, $B=1610$, $C=1950 \rightarrow 1950-820=1130$ metros

O comprimento excede em 1130 metros.