→ Lista 4

a) $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}\cdot\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}2\\-1\end{bmatrix}$ → $x = 2$, $y = -1$

b) $\begin{bmatrix}1&0&0&0\\0&1&0&0\\0&0&1&0\\0&0&0&1\end{bmatrix}\cdot\begin{bmatrix}w\\x\\y\\z\end{bmatrix}=\begin{bmatrix}4\\3\\2\\1\end{bmatrix}$ $w = 4$, $y = 2$, $x = 3$, $z = 1$

c) $\begin{bmatrix}1&0&0&0\\0&1&0&0\\0&0&1&1\end{bmatrix}\cdot\begin{bmatrix}w\\x\\y\\z\end{bmatrix}=\begin{bmatrix}6\\3\\2\end{bmatrix}$ $\begin{cases}w=6\\x=3\\y+z=2 \Rightarrow y=z+2\end{cases}$ $S=\{w,x,y,z \in \mathbb{R} / w=6, x=3, y=z+2\}$

d) $\begin{bmatrix}1&0&3\\0&1&-1\end{bmatrix}\cdot\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}1\\2\end{bmatrix} \Rightarrow$ $x+3z=1 \to x=1-3z$; $y-z=2 \to y=2+z$; $z=0$

e) $\begin{bmatrix}1&0&0&-7\\0&1&0&3\\0&0&1&1\end{bmatrix}\cdot\begin{bmatrix}w\\x\\y\\z\end{bmatrix}=\begin{bmatrix}8\\2\\-5\end{bmatrix} \Rightarrow$ $w-7z=8 \to w=8-7z$; $x+3z=2 \to x=2-3z$; $y+z=-5 \to y=-5-z$; $z=0$ | $S=\{w,x,y,z \in \mathbb{R} / w=8-7z, x=2-3z, y=-5-z\}$

f) $\begin{bmatrix}1&-6&0&0&3\\0&0&1&0&4\\0&0&0&1&5\\0&0&0&0&0\end{bmatrix}\cdot\begin{bmatrix}v\\w\\x\\y\\z\end{bmatrix}=\begin{bmatrix}-2\\7\\8\\0\end{bmatrix}$ $v-6w+3z=-2 \to v=-2+6w-3z$ // $x+4z=7 \to x=7-4z$ // $y+5z=8 \to y=8-5z$ // $z=0$ //

2-

a) $\left[\begin{array}{cc|c}3&-4&1\\1&3&9\end{array}\right] \xrightarrow{L_1=(L_1\div 3)} \left[\begin{array}{cc|c}1&-4/3&1/3\\1&3&9\end{array}\right] \xrightarrow{L_2=L_2+L_1} \left[\begin{array}{cc|c}1&-4/3&1/3\\0&+7/3&26/3\end{array}\right] \Rightarrow \begin{array}{ccc}x&y&\\\end{array}\left[\begin{array}{cc|c}1&-4/3&1/3\\0&1&27/3\end{array}\right]$ $= x-\frac{4}{3}y=\frac{1}{3} \Rightarrow x=\frac{1}{3}+\frac{4}{3}y$; $y=\frac{27}{3}=9$

b) $\left[\begin{array}{cc|c}5&8&34\\10&16&50\end{array}\right] = \left[\begin{array}{cc|c}10&16&34\\10&16&50\end{array}\right]$ Impossível realizar pois a segunda equação é o dobro da primeira

c) $\left[\begin{array}{cc|c}1&2&5\\2&-3&-4\end{array}\right] \xrightarrow{L_2=(L_2-L_1)} \left[\begin{array}{cc|c}1&2&5\\-1&-1&-9\end{array}\right] \xrightarrow{L_2=L_2+L_1} \left[\begin{array}{cc|c}1&2&5\\0&1&-4\end{array}\right]$ → $x+2y=5 \to x=5-2y$; → $y=-4$

d) $\left[\begin{array}{ccc|c}3&2&-5&8\\2&-4&-2&-4\\1&-2&-3&-4\end{array}\right] = \left[\begin{array}{ccc|c}1&-2&-3&-4\\2&-4&-2&-4\\3&2&-5&8\end{array}\right] = \left[\begin{array}{ccc|c}1&-2&-3&-4\\0&0&4&4\\0&8&4&20\end{array}\right] = \left[\begin{array}{ccc|c}1&-2&0&-1\\0&0&1&1\\0&8&0&16\end{array}\right] = \left[\begin{array}{ccc|c}1&0&0&3\\0&0&1&1\\0&1&0&2\end{array}\right]$ $x=3$, $z=1$, $y=2$

$L_2=L_2-(2\cdot R_1)$ $L_3=L_3-(3R_1)$ | $L_1=L_1+3L_2$ $L_3=L_3-4L_2$ | $L_3=L_3\div 8$ $L_1=L_1+2L_3$

e) $\left[\begin{array}{ccc|c}2&-6&0&-4\\1&3&0&1\\4&12&0&2\end{array}\right] = \left[\begin{array}{cccc}1&3&0&1\\2&-6&0&-4\\4&12&0&2\end{array}\right] = \left[\begin{array}{cccc}1&3&0&1\\0&-12&0&-2\\0&0&0&-5\end{array}\right] = 0x+0y=-5$ → Impossível, ou seja, não tem solução

$L_2=(L_2-(L_1\cdot 2))$
$L_3=[(L_3\div 2)\cdot(-1)]+L_2$

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f)
$$\left[\begin{array}{ccc|c}1&2&-1&2\\2&-1&3&9\\3&3&-2&3\end{array}\right]=\begin{bmatrix}1&2&-1&2\\0&-5&5&5\\0&-3&1&-3\end{bmatrix}=\begin{bmatrix}1&2&-1&-2\\0&+1&1&-1\\0&-3&1&-3\end{bmatrix}=\begin{bmatrix}1&0&1&4\\0&1&-1&-1\\0&0&2&-6\end{bmatrix}=\begin{bmatrix}1&0&1&4\\0&1&-1&-1\\0&0&-1&3\end{bmatrix}=\begin{bmatrix}1&0&0&1\\0&1&0&2\\0&0&1&3\end{bmatrix}$$

$x=1$, $y=2$, $z=3$

$L_2=L_2-2L_1$, $L_3=L_3-3L_1$; $L_2=L_2/(-5)$; $L_1=L_1-2\cdot L_2$, $L_3=L_3+3L_2$; $L_3=L_3/(-2)$; $L_1=L_1-L_3$, $L_2=L_2+L_3$

g)
$$\begin{bmatrix}1&0&3&-8\\2&-4&0&-4\\3&-2&-5&26\end{bmatrix}=\begin{bmatrix}1&0&3&-8\\0&-4&-6&12\\0&-2&-14&90\end{bmatrix}=\begin{bmatrix}1&0&3&-8\\0&1&\frac{3}{2}&-3\\0&-2&-14&50\end{bmatrix}=\begin{bmatrix}1&0&3&-8\\0&1&3/2&-3\\0&0&-11&44\end{bmatrix}=\begin{bmatrix}1&0&3&-8\\0&1&3/2&-3\\0&0&1&4\end{bmatrix}=\begin{bmatrix}1&0&0&-4\\0&1&0&3\\0&0&1&-4\end{bmatrix}$$

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

$L_2=L_2-2L_1$, $L_3=L_3-3L_1$; $L_2=L_2/(-4)$; $L_3=L_3+2L_2$; $L_3/(-11)$; $L_1=L_1-3L_3$, $L_2=L_2-(\frac{3}{2})L_3$

h)
$$\left[\begin{array}{ccc|c}1&2&3&10\\3&4&6&23\\2&2&3&13\end{array}\right]=\begin{bmatrix}1&2&3&10\\0&-2&-3&-7\\0&-2&-3&-7\end{bmatrix}=\begin{bmatrix}1&2&3&10\\0&1&3/2&\frac{7}{2}\\0&-2&-3&-7\end{bmatrix}=\begin{bmatrix}1&0&0&3\\0&1&\frac{3}{2}&\frac{7}{2}\\0&0&0&0\end{bmatrix}$$

$x=3$, $y=\frac{7}{2}-\frac{3}{2}z$, $z=t$

$L_2=L_2-3L_1$, $L_3=L_3-2L_1$; $L_2/(-2)$; $L_1=L_1-2L_2$, $L_3=L_3+2L_3$

i)
$$\left[\begin{array}{cccc|c}1&-3&4&-1&2\\2&-1&3&-2&19\end{array}\right]=\begin{bmatrix}1&-3&4&-1&2\\0&5&-5&0&15\end{bmatrix}=\begin{bmatrix}1&-3&4&-1&2\\0&1&-1&0&3\end{bmatrix}=\begin{array}{c}\begin{matrix}x&y&z&w&\ \end{matrix}\\ \begin{bmatrix}1&0&1&-1&11\\0&1&-1&0&3\end{bmatrix}\end{array}$$

$W=5$, $y=3+t$, $z=t$, $x=11-t+5$

$L_2=L_2-2L_1$; $L_2/5$; $L_1=L_1+3L_2$

3-

a)
$$\left[\begin{array}{cccc|c}1&2&3&1&8\\1&3&0&1&7\\1&0&2&1&3\end{array}\right]=\begin{bmatrix}1&2&3&1&8\\0&1&-3&0&-1\\0&-2&-1&0&-5\end{bmatrix}=\begin{bmatrix}1&2&3&1&8\\0&1&-3&0&-1\\0&0&-7&0&-7\end{bmatrix}=\begin{bmatrix}1&2&3&1&8\\0&1&-3&0&1\\0&0&1&0&1\end{bmatrix}=\begin{array}{c}\begin{matrix}x&y&z&w&\ \end{matrix}\\ \begin{bmatrix}1&0&0&1&1\\0&1&0&0&2\\0&0&1&0&1\end{bmatrix}\end{array}$$

$x=1-w$, $y=2$, $z=1$, $w=$

$L_2=L_2-L_1$, $L_3=L_3-L_1$; $L_3=L_3+2L_2$; $L_3=-\frac{1}{7}\cdot L_3$; $L_1=L_3-3L_3$, $L_2=L_2+3L_3$

b)
$$\begin{bmatrix}1&1&3&-3&0\\0&2&1&-3&3\\1&0&2&-1&-1\end{bmatrix}=\begin{bmatrix}1&1&3&-3&0\\-1&1&-2&0&3\\0&-1&-1&2&-1\end{bmatrix}=\begin{bmatrix}1&1&3&-3&0\\0&2&1&-3&3\\0&-1&-1&2&-1\end{bmatrix}=\begin{bmatrix}1&0&2&1&-1\\0&1&0&1&2\\0&-1&-1&2&-1\end{bmatrix}=\begin{array}{c}\begin{matrix}x&y&z&w&\ \end{matrix}\\ \begin{bmatrix}1&0&2&1&-1\\0&1&0&1&2\\0&1&1&-2&1\end{bmatrix}\end{array}\Rightarrow$$

$x=-1+w-2z$, $y=2-w$, $z=-y-2w+1$, $w=$ livre

$L_2=L_2-L_1$, $L_3=L_3-L_1$; $L_2=L_2+L_1$; $L_1=L_1+L_3$, $L_2=L_2+L_3$; $L_1=L_1\cdot(-1)$

c)
$$\begin{bmatrix}1&2&3&0\\1&1&1&0\\1&1&2&0\\1&3&3&0\end{bmatrix}=\begin{bmatrix}1&2&3&0\\0&-1&-2&0\\0&-1&-1&0\\0&1&0&0\end{bmatrix}=\begin{bmatrix}1&2&3&0\\0&-1&-2&0\\0&0&1&0\\0&0&2&0\end{bmatrix}=\begin{bmatrix}1&2&3&0\\0&-1&-2&0\\0&0&1&0\\0&0&0&0\end{bmatrix}=\begin{bmatrix}1&0&0&0\\0&1&0&0\\0&0&1&0\\0&0&0&0\end{bmatrix}=$$

$x=0$, $z=0$, $y=0$, $w=$ livre

$L_2=L_2-L_1$, $L_3=L_3-L_1$, $L_4=L_4-L_1$; $L_3=L_3-L_2$, $L_4=L_4+L_2$; $L_4=L_4-2L_3$; $L_2=L_2+2L_3$, $L_1=L_1-3L_3$, $L_1=L_1-2L_2$

4-
$$\begin{array}{c}\begin{matrix}x&y&z&\ &\ \end{matrix}\\ \begin{bmatrix}1&-2&1&1&2\\2&-5&1&-2&-1\\3&-7&2&-1&2\end{bmatrix}\end{array}=\begin{bmatrix}1&-2&1&1&2\\0&-1&-1&-4&-5\\0&-1&-1&-4&-4\end{bmatrix}=\begin{bmatrix}1&-2&1&1&2\\0&1&1&4&5\\0&-1&-1&-4&-4\end{bmatrix}=\begin{bmatrix}1&-2&1&1&2\\0&1&1&4&5\\0&0&0&0&1\end{bmatrix}=\begin{bmatrix}1&0&3&9&12\\0&1&1&4&5\\0&0&0&0&1\end{bmatrix}$$

$L_2=L_2-2L_1$, $L_3=L_3-3L_1$; $L_2=L_2\cdot(-1)$; $L_3=L_3+L_2$; $L_1=L_1+2L_2$

$$B_1=\begin{bmatrix}9\\4\\0\end{bmatrix}\quad B_2=\begin{bmatrix}2\\5\\1\end{bmatrix}$$

5-

a) $\left(\begin{bmatrix}1&0&5\\1&1&1\\0&1&-4\end{bmatrix} + 4\cdot\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}x\right) = \begin{bmatrix}0&0&0\\0&0&0\\0&0&0\end{bmatrix}$

$S=\{x_3=-x_1;\ -x_1-x_3=5x_2;\ -x_2=8x_3\}$

$\begin{pmatrix}1&0&5\\1&1&1\\0&1&-4\end{pmatrix} + \begin{pmatrix}4&0&0\\0&4&0\\0&0&4\end{pmatrix}\cdot x = \begin{pmatrix}0&0&0\\0&0&0\\0&0&0\end{pmatrix}$

$\begin{pmatrix}4&0&0\\0&4&0\\0&0&4\end{pmatrix}\cdot\begin{pmatrix}x_1\\x_2\\x_3\end{pmatrix} = \begin{pmatrix}0&0&0\\0&0&0\\0&0&0\end{pmatrix} - \begin{pmatrix}1&0&5\\1&1&1\\0&1&-4\end{pmatrix} \to \begin{pmatrix}-1&0&-5\\-1&-1&-1\\0&-1&-4\end{pmatrix}$

$\begin{bmatrix}4x_1\\4x_2\\4x_3\end{bmatrix} = \begin{bmatrix}-1&0&-5\\-1&-1&-1\\0&-1&-4\end{bmatrix}$

$-x_1-5x_3=4x_1$
$-5x_3=5x_1$
$x_3=-x_1$

$-x_1-x_2-x_3=4x_2$
$-x_1-x_3=5x_2$

$-x_2-4x_3=4x_3$
$-x_2=8x_3$

b) $\begin{pmatrix}1&0&5\\1&1&1\\0&1&-4\end{pmatrix}\cdot\begin{pmatrix}x_1\\x_2\\x_3\end{pmatrix} = 2\begin{pmatrix}x_1\\x_2\\x_3\end{pmatrix}$

$\begin{pmatrix}x_1+5x_3\\x_1+x_2+x_3\\x_2-4x_3\end{pmatrix} = \begin{pmatrix}2x_1\\2x_2\\2x_3\end{pmatrix}$

$x_1+5x_3=2x_1$
$-x_1=5x_3$ //

$x_1+x_2+x_3=2x_2$
$x_2=x_1+x_3$ //

$x_2-4x_3=2x_3$
$6x_3=x_2$ //

$S=\{-x_1=5x_3;\ x_2=x_1+x_3;\ 6x_3=x_2\}$

6-

a) $\begin{cases}x+y+z=2\\2x+3y+2z=5\\2x+3y+(a^2-1)z=a+1\end{cases}$

→ S.P.D $(a^2-1)=b$, $a+1=c$

$\begin{bmatrix}1&1&1&2\\2&3&2&5\\2&3&b&c\end{bmatrix}$ posto = nº de incognitas
↳ $b\neq 2$ e $c\neq 5$ para que não haja linhas nulas

$a^2-1\neq 2$
$a\neq\pm\sqrt{3}$

$a+1\neq 5$
$a\neq\pm 4$

→ S.P.I

posto < n $b=2$ e $c=5$ para que haja equações
posto < 3 dependentes e uma linha nula

$a^2-1=2$
$a=\sqrt{3}$

$a+1=5$
$a=4$

→ S.I

$a+1\neq 5$ para que haja incompatibilidade entre a linha 2 e 3, e $a^2-1=2$

$a+1\neq 5$
$a\neq\pm 4$

$a^2-1=2$
$a=\pm\sqrt{3}$

b) $\begin{bmatrix}1&2&-3&4\\3&-1&5&2\\4&1&b&c\end{bmatrix} = \begin{bmatrix}1&2&-3&4\\0&-7&14&-10\\0&-7&a^2-2&a-14\end{bmatrix} = \begin{bmatrix}1&2&-3&4\\0&-7&14&-10\\0&0&a^2-16&a-4\end{bmatrix}$

L_2-3L_1 e $L_3=L_3-4L_1$ $\quad L_3=L_3-L_2$

→ S.P.D

posto = nº de incognitas $a^2-16\neq 0 \to a=\pm 4$

→ S.P.I $a^2-16=0$ e $a-4=0$

posto < n $a=4$ $a=a=14$

posto < 3

→ S.I

$a^2-16=0$ e $a-4\neq 0$ (contradição

7)

a-

$$\left[\begin{array}{cc|cc} 2 & -2 & 1 & 0 \\ 3 & 1 & 0 & 1 \end{array}\right] = \begin{bmatrix} 1 & -1 & 1/2 & 0 \\ 3 & 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 0 & 1/2 & 1 \\ 3 & 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 1/8 & 1/4 \\ -1 & 1 & -1/2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 1/8 & 1/4 \\ 0 & 1 & -3/8 & 1/4 \end{bmatrix}$$

$L_2 = L_2 + L_1$ $L_2 = L_2 - L_1$, $L_1 = L_1/4$ $L_2 = L_2 + L_1$

b)

$$\left[\begin{array}{ccc|ccc} 2 & -2 & 0 & 1 & 0 & 0 \\ 1 & 2 & 1 & 0 & 1 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 \end{array}\right] = \begin{bmatrix} 1 & -1 & 0 & 1/2 & 0 & 0 \\ 1 & 2 & 1 & 0 & 1 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 & 1/2 & 0 & 0 \\ 0 & 3 & 1 & -1/2 & 1 & 0 \\ 0 & 1 & -1 & 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 & 1/2 & 0 & 0 \\ 0 & 1 & 1/3 & -1/6 & 1/3 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 & 1/2 & 0 & 0 \\ 0 & 1 & 1/3 & -1/6 & 1/3 & 0 \\ 0 & 0 & 4/3 & 1/6 & -1/3 & 1 \end{bmatrix}$$

$L_1/2$ $L_2 = L_2 - L_1$ $L_2 = \frac{1}{3} L_2$ $L_3 = L_3 - L_2$ $L_3 = \frac{-4}{3} L_3$

$$\begin{bmatrix} 1 & -1 & 0 & 1/2 & 0 & 0 \\ 0 & 1 & 1/3 & -1/6 & 1/3 & 0 \\ 0 & 0 & 1 & -1/8 & 1/4 & -3/4 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 & 1/2 & 0 & 0 \\ 0 & 1 & 0 & -1/8 & 1/4 & 1/4 \\ 0 & 0 & 1 & -1/8 & 1/4 & -3/4 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 3/8 & 1/4 & 1/4 \\ 0 & 1 & 0 & -1/8 & 1/4 & 1/4 \\ 0 & 0 & 1 & -1/8 & 1/4 & -3/4 \end{bmatrix}$$

$L_2 = L_2 - \frac{1}{3} L_3$ $L_1 = L_1 + L_2$

c)

$$\left[\begin{array}{cc|cc} 3 & 5 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{array}\right] = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 3 & 5 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 1 & 1 & -1 & -2 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & -1 & -1 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & 1 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & -2 & -5 \\ 0 & 1 & 1 & 3 \end{bmatrix}$$

$L_2 \rightleftarrows L_1$ $L_2 = L_2 - 2L_1$ $L_2 = L_2 - L_1$ $L_2 = L_2 \cdot (-1)$ $L_1 = L_1 - (2L_2)$

d)

$$\left[\begin{array}{ccc|ccc} 0 & -1 & 1 & 1 & 0 & 0 \\ 2 & 0 & -1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{array}\right] = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 2 & 0 & -1 & 0 & 1 & 0 \\ 0 & -1 & 1 & 1 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 1 & -1 & -1 & 0 & 1 & -1 \\ 1 & 0 & 1 & 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ -1 & 1 & 1 & 0 & -1 & 1 \\ 1 & 0 & 1 & 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 2 & 0 & -1 & 1 \\ 1 & 0 & 1 & 1 & 0 & 1 \end{bmatrix} =$$

$L_2 = L_2 \cdot (-1)$ $L_2 = L_2 + L_3$ $L_3 = L_3 - L_1$

$L_2 = L_2 - L_1$ e $L_3 = L_3 + L_1$

$$\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 2 & 0 & -1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 2 & 0 & -1 & 1 \\ 0 & 0 & -1 & 1 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 & 1 & 1 \\ 0 & 0 & -1 & 1 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & -2 & -1 & 0 \\ 0 & 1 & 0 & 2 & 1 & 1 \\ 0 & 0 & 1 & -1 & -1 & 0 \end{bmatrix}$$

$L_3 = L_3 - L_2$ $L_2 = L_2 + (2L_3)$ $L_3 = L_3 \cdot (-1)$ e $L_1 = L_1 - L_2$

e)

$$\left[\begin{array}{cccc|cccc} 2 & -1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & -1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 2 & 3 & 0 & 0 & 1 & 0 \\ 0 & 0 & -2 & 0 & 0 & 0 & 0 & 1 \end{array}\right] = \begin{bmatrix} 1 & -1/2 & 0 & 1/2 & 1/2 & 0 & 0 & 0 \\ 0 & 2 & 0 & -1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 2 & 3 & 0 & 0 & 1 & 0 \\ 0 & 0 & -2 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1/2 & 0 & 1/2 & 1/2 & 0 & 0 & 0 \\ 0 & 2 & 0 & -1 & 0 & 1 & 0 & 0 \\ 0 & 1/2 & 2 & 5/2 & -1/2 & 0 & 1 & 0 \\ 0 & 0 & -2 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1/2 & 0 & 1/2 & 1/2 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1/2 & 0 & -1/2 & 0 & 0 \\ \\ \end{bmatrix}$$

$L_1 = L_1/2$ $L_3 = L_3 - L_1$ $L_2 = \frac{1}{2} L_2$ $L_1 = L_1 + \frac{1}{2} L_2$

$$\begin{bmatrix} 1 & 0 & 0 & 1/4 & 1/2 & 1/4 & 0 & 0 \\ 0 & 1 & 0 & -1/2 & 0 & 1/2 & 0 & 0 \\ \\ \end{bmatrix} = \begin{bmatrix} \\ 0 & 1 & 0 & -1/2 & 0 & 1/2 & 0 & 0 \\ 0 & 0 & 2 & 7/2 & -1/2 & -1/4 & 1 & 0 \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ 0 & 0 & 1 & 7/4 & -1/4 & -1/8 & 1/2 & 0 \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ 0 & 0 & 0 & 7/2 & -1/2 & -1/4 & 1 & 1 \end{bmatrix}$$

$L_3 = L_3 - \frac{1}{2} L_2$ $L_3 = L_3 \cdot \frac{1}{2}$ $L_4 = L_4 + 2L_3$ $L_4 = L_4 \cdot \frac{7}{2}$

$$\begin{bmatrix} 1 & 0 & 0 & 1/4 & 1/2 & 1/4 & 0 & 0 \\ 0 & 1 & 0 & -1/2 & 0 & 1/2 & 0 & 0 \\ 0 & 0 & 1 & 7/4 & -1/4 & -1/8 & 1/2 & 0 \\ 0 & 0 & 0 & 1 & -1/7 & -1/14 & 2/7 & 2/7 \end{bmatrix}$$

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8)

x = calça
y = shorts
z = blusas

$$\begin{cases} x+2y+3z=26 \\ 2x+5y+6z=60 \\ 2x+3y+4z=40 \end{cases}$$

$$\begin{bmatrix} 1 & 2 & 3 & 26 \\ 2 & 5 & 6 & 60 \\ 2 & 3 & 4 & 40 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 & 26 \\ 0 & 1 & 0 & 8 \\ 1 & 1 & 1 & 14 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 3 & 10 \\ 0 & 1 & 0 & 8 \\ 1 & 0 & 1 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 3 & 10 \\ 0 & 1 & 0 & 8 \\ 0 & 0 & -2 & -4 \end{bmatrix} =$$

$L_2 = L_2 - (2L_1)$; $L_3 = L_3 - L_1$ — $L_1 = L_1 - (2L_2)$; $L_3 = L_3 + L_2$ — $L_3 = L_3 - L_1$ — $L_3 = L_3/(-2)$

$$\begin{bmatrix} 1 & 0 & 3 & 10 \\ 0 & 1 & 0 & 8 \\ 0 & 0 & 1 & 2 \end{bmatrix}$$

$x + 3z = 10 \rightarrow x = 10 - 3\cdot(2) = 4$ //
$y = 8$ //
$z = 2$ //

9)

x = sundae
y = casquinha
z = banana split

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

$$\begin{cases} 5x+2y+6z=2200 \\ y = 3z \rightarrow y \\ y = x + z \end{cases}$$

$$\begin{cases} 5\cdot(3z-z)+2(3z)+6z=2200 \\ 10z+6z+6z=2200 \\ 22z=2200 \rightarrow z=100 \text{ //} \end{cases}$$

$y = 3z$
$y = 3\cdot 100 = 300$ //

$x = 300 - 100$
$x = 200$ //

$$\begin{bmatrix} 1 & -1 & -1 & 0 \\ 0 & 1 & -3 & 0 \\ 10 & 5 & 1 & 2200 \end{bmatrix}$$

$L_2 = L_1 + L_2$

10)

x = torta
y = salada
z = pizza

$$\begin{cases} 40x+30y+10z=7000 \\ 20x+40y+30z=6000 \\ 10x+20y+40z=5000 \end{cases}$$

$2(20x+40y+30z)-(40x+30y+10z) = 12000 - 7000$
$50y + 50z = 5000$
$50y + (50\cdot 80) = 5000$
$50y = 1000$ — $150z$
$y = 20$ //

$2(10x+20y+40z)-(20x+40y+30z) = (5000\cdot 2) - 6000$
$50z = 4000$
$z = 80$ //

$10x+20y+40z=5000$ $:10$
$x + 2y + 4z = 500$
$x + 2\cdot 20 + 4\cdot 80 = 500$
$x = 500 - 360$
$x = 140$ //

11)

A = x
B = y
C = z

$$\begin{cases} 2x+3y+z=8420 \\ x+2y+2z=7940 \\ 4x+3y+0z=8110 \end{cases}$$

$z = 2x + 310$

$2(2x+3y+z)-(x+2y+2z) = (8420\cdot 2) - 7940$
$3x + 4y = 8900$
$4x + 3y = 8110$
$-x + y = 790$
$\rightarrow y = 790 + x$
$y = 1610$

$2x + 3(790+x) + (2x+310) = 8420$
$2x + 2370 + 3x + 2x + 310 = 8420$
$5x = 5740$
$x = 820$

$z = 2\cdot 820 + 310$
$z = 1950$

maior - menor = 1130