1) $\begin{cases} 2x - y + 3z = 11 \\ 4x - 3y + 2z = 0 \\ x + y + z = 6 \\ 3x + y + z = 4 \end{cases}$

$$\left[\begin{array}{cccc} 2 & -1 & 3 & 11 \\ 4 & -3 & 2 & 0 \\ 1 & 1 & 1 & 6 \\ 3 & 1 & 1 & 4 \end{array}\right] \sim \left[\begin{array}{cccc} 1 & 1 & 1 & 6 \\ 2 & -1 & 3 & 11 \\ 4 & -3 & 2 & 0 \\ 3 & 1 & 1 & 4 \end{array}\right] \sim$$

$$\left[\begin{array}{cccc} 1 & 1 & 1 & 6 \\ 0 & 3 & -1 & 1 \\ 0 & 7 & 2 & 24 \\ 0 & 2 & 2 & 14 \end{array}\right] \sim \left[\begin{array}{cccc} 1 & 1 & 1 & 6 \\ 0 & 3 & -1 & 1 \\ 0 & 7 & 2 & 24 \\ 0 & 1 & 1 & 7 \end{array}\right] \sim \left[\begin{array}{cccc} 1 & 1 & 1 & 6 \\ 0 & 1 & 1 & 7 \\ 0 & 3 & -1 & 1 \\ 0 & 7 & 2 & 24 \end{array}\right] \sim$$

$$\left[\begin{array}{cccc} 1 & 1 & 1 & 6 \\ 0 & 1 & 1 & 7 \\ 0 & 0 & 4 & 20 \\ 0 & 0 & 5 & 25 \end{array}\right] \sim \left[\begin{array}{cccc} 1 & 1 & 1 & 6 \\ 0 & 1 & 1 & 7 \\ 0 & 0 & 1 & 5 \\ 0 & 0 & 1 & 5 \end{array}\right]$$

$$\begin{cases} x + y + z = 6 \\ y + z = 7 \\ z = 5 \end{cases}$$

Из $\boxed{z = 5}$, тогда $y + z = 7$, $x + z + 5 = 6$

$y + 5 = 7$, $x + 7 = 6$

$y = 7 - 5$, $x = 6 - 7$

$\boxed{y = 2}$, $\boxed{x = -1}$

$S = \{x = -1,\ y = 2,\ z = 5\}$

3) a)
$$\begin{bmatrix} 1 & -2 & -3 & -1 \\ 2 & -1 & 2 & 3 \\ 3 & 1 & 2 & 3 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 2 & -1 & 2 & 3 \\ 1 & -2 & 3 & -1 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & -5/3 & 2/3 & 1 \\ 1 & -2 & 3 & -1 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & 5 & -2 & -3 \\ 1 & -2 & 3 & -1 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & 5 & -2 & -3 \\ 0 & -7/3 & 7/3 & -2 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & 5 & -2 & 3 \\ 0 & -7 & 7 & 6 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & -7 & 7 & 6 \\ 0 & 5 & -2 & -3 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & -7 & 7 & -6 \\ 0 & 0 & 3 & -51/7 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & 7 & -7 & 6 \\ 0 & 0 & 3 & -51/7 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & 7 & -7 & 6 \\ 0 & 0 & 7 & -17 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & 7 & -7 & 6 \\ 0 & 0 & 1 & -17/7 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 2 & 3 \\ 0 & 7 & 0 & -11 \\ 0 & 0 & 1 & -17/7 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 1 & 0 & 55/7 \\ 0 & 1 & 0 & -11 \\ 0 & 0 & 1 & -17/7 \end{bmatrix} \sim \begin{bmatrix} 3 & 1 & 0 & 55/7 \\ 0 & 1 & 0 & -11/7 \\ 0 & 0 & 1 & -17/7 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 0 & 0 & 66/7 \\ 0 & 1 & 0 & -11/7 \\ 0 & 0 & 1 & -17/7 \end{bmatrix} * \sim \begin{bmatrix} 1 & 0 & 0 & 22/7 \\ 0 & 1 & 0 & -11/7 \\ 0 & 0 & 1 & -17/7 \end{bmatrix}$$

b) $\begin{bmatrix} 0 & 1 & 3 & -2 \\ 2 & 1 & -4 & 3 \\ 2 & 3 & 2 & -1 \end{bmatrix} \sim \begin{bmatrix} 2 & 1 & -4 & 3 \\ 0 & 1 & 3 & -2 \\ 2 & 3 & 2 & -1 \end{bmatrix} \sim \begin{bmatrix} 2 & 1 & -4 & 3 \\ 0 & 1 & 3 & -2 \\ 0 & 2 & 6 & -4 \end{bmatrix}$

$\begin{bmatrix} 2 & 1 & -4 & 3 \\ 0 & 1 & 3 & -2 \\ 0 & 1 & 3 & -2 \end{bmatrix} \sim \begin{bmatrix} 2 & 1 & -4 & 3 \\ 0 & 1 & 3 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 2 & 0 & -7 & 5 \\ 0 & 1 & 3 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim$

$* \begin{bmatrix} 1 & 0 & -7/2 & 5/2 \\ 0 & 1 & 3 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 0 & 2 & 2 \\ 1 & 1 & 3 \\ 3 & -4 & 2 \\ 2 & -3 & 1 \end{bmatrix} \sim \begin{bmatrix} 3 & -4 & 2 \\ 1 & 1 & 3 \\ 0 & 2 & 2 \\ 2 & -3 & 1 \end{bmatrix} \sim \begin{bmatrix} 3 & -4 & 2 \\ 0 & 7/3 & 7/3 \\ 0 & 2 & 2 \\ 2 & -3 & 1 \end{bmatrix} \sim \begin{bmatrix} 3 & -4 & 2 \\ 0 & 1 & 1 \\ 0 & 2 & 2 \\ 2 & -3 & 1 \end{bmatrix}$

$\begin{bmatrix} 3 & -4 & 2 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \\ 2 & -3 & 1 \end{bmatrix} \sim \begin{bmatrix} 3 & -4 & 2 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & -1/3 & -1/3 \end{bmatrix} \sim \begin{bmatrix} 3 & -4 & 2 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & -1 & -1 \end{bmatrix} \sim$

$\begin{bmatrix} 3 & -4 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & -1 & -1 \end{bmatrix} \sim \begin{bmatrix} 3 & -4 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 0 & 6 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \sim$

$* \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

/ /

5) $\begin{cases} 3x + 5y = 1 \\ 2x + z = 3 \\ 5x + y - z = 0 \end{cases}$ $\left[\begin{array}{cccc} 3 & 5 & 0 & 1 \\ 2 & 0 & 1 & 3 \\ 5 & 1 & -1 & 0 \end{array}\right]$

$\sim \left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 2 & 0 & 1 & 3 \\ 3 & 5 & 0 & 1 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & -2/5 & 7/5 & 3 \\ 3 & 5 & 0 & 1 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 2 & -7 & -15 \\ 3 & 5 & 0 & 1 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 2 & -7 & -15 \\ 0 & 22/5 & 3/5 & 1 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 2 & -7 & -15 \\ 0 & 22 & 3 & 5 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 22 & 3 & 5 \\ 0 & 2 & -7 & -15 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 22 & 3 & 5 \\ 0 & 0 & -80/11 & -170/11 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 22 & 3 & 5 \\ 0 & 0 & 8 & 17 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 22 & 3 & 5 \\ 0 & 0 & 1 & 17/8 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 5 & 1 & -1 & 0 \\ 0 & 22 & 0 & -11/8 \\ 0 & 0 & 1 & 17/8 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & 0 & 17/8 \\ 0 & 22 & 0 & -11/8 \\ 0 & 0 & 1 & 17/8 \end{array}\right] \sim \left[\begin{array}{cccc} 5 & 1 & 0 & 17/8 \\ 0 & 1 & 0 & -1/16 \\ 0 & 0 & 1 & 17/8 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 5 & 0 & 0 & 35/16 \\ 0 & 1 & 0 & -1/16 \\ 0 & 0 & 1 & 17/18 \end{array}\right] \sim \left[\begin{array}{cccc} 1 & 0 & 0 & 7/16 \\ 0 & 1 & 0 & -1/16 \\ 0 & 0 & 1 & 17/8 \end{array}\right]$

ou seja; $S = \left\{ x = \frac{7}{16} \; ; \; y = \frac{-1}{16} \; ; \; z = \frac{17}{8} \right\}$

6) $\begin{cases} -4x + 3y = -2 & (I) \\ 5x - 4y = 0 & (II) \\ 2x - y = K & (III) \end{cases}$

I) $3y = 2 + 4x$

II) $5x = 4y$

$x = \frac{4y}{5}$ (subst I)

$3y = 2 + 4\left(\frac{4y}{5}\right)$

$3y = 2 + \frac{16y}{5}$ ⇝ mmc do 5

⇝ $15y = 10 + 16y$

$-y = 10$

$y = -10$

$5x = 4 \cdot (-10)$

$5x = -40$

$x = -40/5$

$x = -8$

III) $2 \cdot (-8) - (-10) = K$

$-16 + 10 = K$

$K = -16 + 10$

* $\boxed{K = -6}$

Para que o sistema admita solução o valor de $K = -6$.

7) $\begin{cases} x1 + 3x2 + 2x3 + 3x4 - 7x5 = 14 \\ 2x1 + 6x2 + x3 - 2x4 + 5x5 = -2 \\ x1 + 3x2 - x3 + 2x5 = -1 \end{cases}$

$$\left[\begin{array}{ccccc|c} 1 & 3 & 2 & 3 & -7 & 14 \\ 2 & 6 & 3 & -4 & 5 & -2 \\ 1 & 3 & -1 & 0 & 2 & -1 \end{array}\right] \sim \left[\begin{array}{ccccc|c} 1 & 3 & 2 & 3 & -7 & 14 \\ 0 & 0 & -3 & -8 & 19 & -30 \\ 0 & 0 & -3 & -3 & 9 & -15 \end{array}\right] \sim$$

$$\left[\begin{array}{ccccc|c} 1 & 3 & 2 & 3 & -7 & 14 \\ 0 & 0 & -3 & -8 & 19 & -30 \\ 0 & 0 & 0 & 5 & -10 & 15 \end{array}\right] \sim \left[\begin{array}{ccccc|c} 1 & 3 & 2 & 3 & -7 & 14 \\ 0 & 0 & 1 & 8/3 & -19/3 & 10 \\ 0 & 0 & 0 & 1 & -2 & 3 \end{array}\right] \sim$$

$$\left[\begin{array}{ccccc|c} 1 & 3 & 0 & 3 & -5 & 10 \\ 0 & 0 & 1 & 0 & -1 & 2 \\ 0 & 0 & 0 & 1 & -2 & 3 \end{array}\right] \sim \left[\begin{array}{ccccc|c} 1 & 3 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & -1 & 2 \\ 0 & 0 & 0 & 1 & -2 & 3 \end{array}\right] \sim$$

Logo:

$$\begin{cases} x1 + 3x2 + x5 = 1 \rightsquigarrow x1 = 1 - 3x2 - x5 \\ x3 - x5 = 2 \rightsquigarrow x3 = 2 + x5 \\ x4 - 2x5 = 3 \rightsquigarrow x4 = 3 + 2x5 \end{cases}$$

8) A nulidade é uma quantidade de conjuntos, por isso não pode ser negativa.

10) a) $x_1 + 2x_2 - x_3 + 3x_4 = 1$ ~ Sistema impossível

11) $\begin{cases} x + y + z = 4 \\ 2x + 5y - 2z = 3 \end{cases} \sim \left[\begin{array}{cccc} 1 & 1 & 1 & 4 \\ 2 & 5 & -2 & 3 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 1 & 1 & 1 & 4 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & -3/2 & 2 & 5/2 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 3 & -4 & -5 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 1 & -4/3 & -5/3 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 2 & 0 & 14/3 & 34/3 \\ 0 & 1 & -4/3 & -5/3 \end{array}\right] \sim \left[\begin{array}{cccc} 1 & 0 & 7/3 & 17/3 \\ 0 & 1 & -4/3 & -5/3 \end{array}\right] \sim$

$x + 7/3z = 17/3$ $\quad$ $y - 4/3z = -5/3$

$\rightsquigarrow x = 17/3 - 7/3z$ $\quad$ $\rightsquigarrow y = -5/3 + 4/3z$

$Pa = 2 = PC$ $\quad GL = 1$

12) $\begin{cases} x + y + z = 4 \\ 2x + 5y - 2z = 3 \\ x + 7y - 7z = 5 \end{cases} \left[\begin{array}{cccc} 1 & 1 & 1 & 4 \\ 2 & 5 & -2 & 3 \\ 1 & 7 & -7 & 5 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 1 & 1 & 1 & 4 \\ 1 & 7 & -7 & 5 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & -3/2 & 2 & 5/2 \\ 1 & 7 & -7 & 5 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 3 & -4 & 5 \\ 1 & 7 & -7 & 5 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 3 & -4 & -5 \\ -1 & -7 & 7 & -5 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 3 & -4 & -5 \\ 0 & -9/2 & 6 & -7/2 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 3 & -4 & -5 \\ 0 & -9 & 12 & -7 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & -9 & 12 & -7 \\ 0 & 3 & -4 & -5 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & -9 & 12 & -7 \\ 0 & 0 & 0 & -22/3 \end{array}\right] \sim$

$\left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 9 & -12 & 7 \\ 0 & 0 & 0 & -22/3 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 9 & -12 & 7 \\ 0 & 0 & 0 & 1 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 5 & -2 & 3 \\ 0 & 1 & -4/3 & 7/9 \\ 0 & 0 & 0 & 1 \end{array}\right] \sim \left[\begin{array}{cccc} 2 & 0 & 14/3 & -8/9 \\ 0 & 1 & -4/3 & 7/9 \\ 0 & 0 & 0 & 1 \end{array}\right] \sim$

$$\left[\begin{array}{ccc|c} 1 & 0 & 7/3 & -4/9 \\ 0 & 1 & -4/3 & 7/9 \\ 0 & 0 & 0 & 1 \end{array}\right] \sim$$

$x + 7/3z = -4/9$

$x = -4/9 - 7/3z$

$y - 4/3z = 7/9$

$y = 7/9 + 4/3z$

$z = \text{libre}$

13) $\begin{cases} x - 2y + 3z = 0 \\ 2x + 5y + 6z = 0 \end{cases} \sim \left[\begin{array}{ccc|c} 1 & -2 & 3 & 0 \\ 2 & 5 & 6 & 0 \end{array}\right] \sim \left[\begin{array}{ccc|c} 2 & 5 & 6 & 0 \\ 1 & -2 & 3 & 0 \end{array}\right] \sim$

$$\left[\begin{array}{ccc|c} 2 & 5 & 6 & 0 \\ 0 & -9/2 & 0 & 0 \end{array}\right] \sim \left[\begin{array}{ccc|c} 2 & 5 & 6 & 0 \\ 0 & -1 & 0 & 0 \end{array}\right] \sim \left[\begin{array}{ccc|c} 2 & 5 & 6 & 0 \\ 0 & 1 & 0 & 0 \end{array}\right] \sim \left[\begin{array}{ccc|c} 2 & 0 & 6 & 0 \\ 0 & 1 & 0 & 0 \end{array}\right]$$

$$\sim \left[\begin{array}{ccc|c} 1 & 0 & 3 & 0 \\ 0 & 1 & 0 & 0 \end{array}\right] \rightsquigarrow \quad x + 3z = 0 \qquad y = 0$$

$x = 3z$

$Pa = 2 = Pc \qquad G.L = 1$

14) $\begin{cases} x1 + x2 + x3 + x4 = 0 \\ x1 + x2 + x3 - x4 = 4 \\ x1 + x2 - x3 + x4 = -4 \\ x1 - x2 + x3 + x4 = 2 \end{cases} \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & -1 & 4 \\ 1 & 1 & -1 & 1 & -4 \\ 1 & -1 & 1 & 1 & 2 \end{array}\right] \sim$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -2 & 4 \\ 1 & 1 & -1 & 1 & -4 \\ 1 & 1 & 1 & 1 & 2 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 2 \\ 1 & 1 & -1 & 1 & -4 \\ 1 & 1 & 1 & 1 & 2 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 2 \\ -1 & -1 & 1 & -1 & 4 \\ 1 & -1 & 1 & 1 & 2 \end{array}\right] \sim$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 2 \\ 0 & 0 & 2 & 0 & 4 \\ 1 & -1 & 1 & 1 & 2 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 2 \\ 0 & 0 & 1 & 0 & 2 \\ 1 & -1 & 1 & 1 & 2 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 2 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & -2 & 0 & 0 & 2 \end{array}\right]$$

$$\sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 2 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & -1 & 0 & 0 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & -1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & -1 & 2 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & -1 & 2 \end{array}\right]$$

$$\left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -2 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 1 & 0 & 2 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -2 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -2 \end{array}\right]$$

$$* \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -2 \end{array}\right]$$

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

15) $\begin{cases} x + 2y + 3z = 0 \\ 2x + y + 3z = 0 \\ 3x + 2y + z = 0 \end{cases}$ $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 1 & 3 & 0 \\ 3 & 2 & 1 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & 1 & 0 \\ 2 & 1 & 3 & 0 \\ 1 & 2 & 3 & 0 \end{bmatrix} \sim$

$\begin{bmatrix} 3 & 2 & 1 & 0 \\ 0 & -1/3 & 7/3 & 0 \\ 1 & 2 & 3 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & 1 & 0 \\ 0 & 1 & -7 & 0 \\ 1 & 2 & 3 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & 1 & 0 \\ 0 & 1 & -7 & 0 \\ 0 & 4/3 & 8/3 & 0 \end{bmatrix} \sim$

$\begin{bmatrix} 3 & 2 & 1 & 0 \\ 0 & 1 & -7 & 0 \\ 0 & 1 & 2 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & 1 & 0 \\ 0 & 1 & -7 & 0 \\ 0 & 0 & 9 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & 1 & 0 \\ 0 & 1 & -7 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \sim$

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

$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

$x = y = z = 0$

$Pa = 3 = PC, \quad G.L = 0$

16) $\begin{cases} 3x + 2y - 4z = 1 \\ x - y + z = 3 \\ x - y - 3z = -3 \\ 3x + 3y - 5z = 0 \\ -x + y + z = 1 \end{cases}$

$$\left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 1 & -1 & 1 & 3 \\ 1 & -1 & -3 & -3 \\ 3 & 3 & -5 & 0 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & -5/3 & 7/3 & 8/3 \\ 1 & -1 & -3 & -3 \\ 3 & 3 & -5 & 0 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 1 & -1 & -3 & -3 \\ 3 & 3 & -5 & 0 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ -1 & 1 & 3 & 3 \\ 3 & 3 & -5 & 0 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim$$

$$\left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 5/3 & 5/3 & 10/3 \\ 3 & 3 & -5 & 0 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 1 & 1 & 2 \\ 3 & 3 & -5 & 0 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 1 & 1 & 2 \\ 0 & 1 & -1 & -1 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim$$

$$\left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 1 & 1 & 2 \\ 0 & -1 & 1 & 1 \\ -1 & 1 & 1 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 1 & 1 & 2 \\ 0 & -1 & 1 & 1 \\ 0 & 5/3 & -1/3 & 4/3 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 1 & 1 & 2 \\ 0 & -1 & 1 & 1 \\ 0 & 5 & -1 & 4 \end{array}\right] \sim$$

$$\left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 12/5 & 18/5 \\ 0 & -1 & 1 & 1 \\ 0 & 5 & -1 & 4 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & -1 & 1 & 1 \\ 0 & 5 & -1 & 4 \end{array}\right] \sim \left[\begin{array}{cccc|c} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & -2/5 & -3/5 \\ 0 & 5 & -1 & 4 \end{array}\right] \sim$$

$$\begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 2 & 3 \\ 0 & 5 & -1 & 4 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 6 & 12 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 1 & 2 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 2 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1/2 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & -8 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 1 \\ 0 & 5 & -7 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 2 & -4 & 0 \\ 0 & 5 & -7 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 0 \\ 0 & 5 & -7 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & -4 & 0 \\ 0 & 5 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim$$

$$\begin{bmatrix} 3 & 2 & 0 & 0 \\ 0 & 5 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 3 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \sim$$

* Resolução cap 2 / Ilzon B. Ramos.
Sistemas Lineares
Álgebra Linear Boldrini 3 edª *

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$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

19) a) Solução trivial ~ $x_i = 0$

b) $\begin{cases} 2x - 5y + 2z = 0 \\ x + y + z = 0 \\ 2x + kz = 0 \end{cases}$ ~

2	-5	2	0	2	-5
1	1	1	0	1	1
2	0	k	0	2	0

$2k \leftrightarrow k = 2$

Faltou 20 - 21 - 22 - ~~23~~ não acho necessário.

23 - Faça o balanceamento da reação.

$HF + SiO_2 \rightarrow SiF_4 + H_2O$

H: $x = 2t$

F: $x = 4z$

Si: $y = z$

O: $2y = t$.

24 a 28 → não acho necessário tbém.