

$$\text{III. } \begin{cases} x + 2y + z = 1 \cdot (-3) \\ 3x + y - 11z = -2 \\ 2x + 3y - z = 1 \end{cases}$$

$$\begin{array}{r} A) -3x - 6y - 3z = -3 \\ + \quad 3x + y - 11z = -2 \\ \hline 0 - 5y - 14z = -5 \end{array}$$

$$\begin{array}{r} B) x + 2y + z = 1 \cdot (-2) \rightarrow -2x - 4y - 2z = -2 \\ + \quad 2x + 3y - z = 1 \\ \hline 0 - y - 3z = -1 \end{array}$$

$$\begin{array}{r} + 0 - y - 3z = -1 \cdot (-5) \rightarrow 5y + 15z = 5 \quad -y - 3 \cdot 0 = -1 \\ + \quad 5y - 14z = -5 \quad -1y = -1 \\ \hline 0 - 0 = -10 \quad y = -1/1 = -1 \\ z = 0 \quad y = 1 \end{array}$$

$$x + 2y + z = 1$$

$$x + 2 \cdot 1 + 0 = 1$$

$$x + 2 = 1$$

$$x = 1 - 2$$

$$x = -1$$

$$x + y + z$$

$$-1 + 1 + 0$$

$$0 = 0$$

$$0 = 0$$

(LÉTRA "C")

$$IV - \begin{cases} x + 2y - 3z = 29 \\ x + 3y + 2z = 4 \\ x - y - 2z = 8 \end{cases} \begin{pmatrix} 1 & 2 & -3 & 29 \\ 1 & 3 & 2 & 4 \\ 1 & -1 & -2 & 8 \end{pmatrix} \begin{pmatrix} 0 & 3 & -1 \\ 0 & 3 & 4 \end{pmatrix} \xrightarrow{R_2 - R_1} \begin{pmatrix} 0 & 3 & -1 \\ 0 & 3 & 4 \end{pmatrix}$$

$$+ \begin{pmatrix} 0 & 1 & -4 & 84 \\ 0 & 3 & 4 & -4 \end{pmatrix} \xrightarrow{R_2 - 3R_1} \begin{pmatrix} 0 & 1 & -4 & 84 \\ 0 & 0 & 16 & -252 \end{pmatrix}$$

$$0 \quad 15 \quad 0 \div 80 \quad 15 \cdot 12 = 21$$

$$y = 80/15 \quad -12 = 21 \cdot 15$$

$$y = 5 \quad z = 41 - 1$$

$$z = -6$$

$$x + 2y - 3z = 29$$

$$x + 2 \cdot 5 - 3 \cdot (-6) = 29$$

$$x + 10 + 18 = 29$$

$$x = -28 + 29$$

$$(x = 1)$$

$$x + y + z$$

$$1 + 5 + (-6)$$

$$6 + (-6)$$

$$6 - 6 = 0 \text{ (Linha "A")}$$

49x

920



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

$$\begin{aligned} 1^a (3.2.0) &= 0 \\ 2^a (2.1.2) &= 4 \\ 3^a (1.0.1) &= 0 \end{aligned}$$

$$D = \boxed{3}$$

$$D_x = \begin{aligned} &1^a (5.2.1) = 10 \quad 1^a (7.2.0) = 0 \\ &2^a (1.1.7) = 7 \quad 2^a (2.1.5) = 10 \\ &3^a (0.3.2) = 0 \quad 3^a (1.3.1) = 3 \end{aligned}$$

$$D_x = \underline{413}$$



$$Dy = \begin{vmatrix} 2 & 5 & 0 & 2 & 5 \\ 0 & 3 & 7 & 0 & 3 \\ 3 & 7 & 7 & 3 & 7 \end{vmatrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (2,3,7)=6 \\ (5,7,3)=15 \\ (0,0,7)=0 \end{matrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (3,3,0)=0 \\ (7,7,2)=14 \\ (1,0,5)=0 \end{matrix}$$

$$\begin{matrix} 21 & - & 14 \end{matrix}$$

$$Dy = 7/3$$

$$Dz = \begin{vmatrix} 2 & 1 & 5 & 2 & 1 \\ 0 & 3 & 3 & 0 & 1 \\ 3 & 2 & 7 & 3 & 2 \end{vmatrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (2,2,7)=28 \\ (7,3,3)=9 \\ (5,0,2)=0 \end{matrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (3,2,5)=30 \\ (2,3,2)=12 \\ (7,0,1)=0 \end{matrix}$$

$$\begin{matrix} 37 & - & 42 \end{matrix}$$

$$Dz = -5/3$$

$$V = \left\{ \left( \frac{4}{3}, \frac{7}{3}, \frac{-5}{3} \right) \right\} \text{ (LETRA "D")}$$

$$V1-D = \begin{vmatrix} 1 & 0 & 0 & 1 & 0 \\ 2 & 1 & 0 & 2 & 1 \\ 1 & 0 & 1 & 2 & 2 \end{vmatrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (1,1,2)=2 \\ (0,0,1)=0 \\ (0,2,2)=0 \end{matrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (1,1,1,0)=0 \\ (2,0,1)=0 \\ (2,2,0)=0 \end{matrix}$$

$$\begin{matrix} 2 & - & 0 \end{matrix}$$

$$D = 2$$

$$Dx = \begin{vmatrix} 3 & 0 & 0 & 3 & 0 \\ 7 & 1 & 0 & 7 & 1 \\ 1 & 2 & 2 & 1 & 2 \end{vmatrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (3,7,2)=6 \\ (0,0,1)=0 \\ (0,7,2)=0 \end{matrix} \begin{matrix} 1^a \\ 2^a \\ 3^a \end{matrix} \begin{matrix} (1,1,1,0)=0 \\ (2,0,3)=0 \\ (2,7,0)=0 \end{matrix}$$

$$\begin{matrix} 6 & - & 0 \end{matrix}$$

$$Dx = 6$$

$$D_1 = \begin{vmatrix} 0 & 124 & 4 & 0 & 135 & 1 \\ 1 & 115 & 5 & 1 & 115 & 2 \\ 2 & 48 & 0 & 2 & 40 & 3 \\ 0 & 0 & 2 & 40 & 3 & 4 \\ 1 & 1 & 1 & 4 & 8 & 1 \end{vmatrix} \begin{matrix} 1^{\circ} (0.115.0) = 0 \\ 2^{\circ} (2.115.4) = 920 \\ 3^{\circ} (134.5.2) = 1340 \\ 4^{\circ} (18.5.0) = 0 \\ 5^{\circ} (4.1.48) = 192 \\ 6^{\circ} (0.1.134) = 0 \end{matrix}$$

$$\begin{matrix} 1532 \\ - \\ 920 \end{matrix}$$

$$D_1 = \underline{612}$$

$$D_2 = \begin{vmatrix} 0 & 3 & 134 & 0 & 3 & 1 \\ 1 & 0 & 115 & 1 & 0 & 2 \\ 2 & 1 & 48 & 2 & 1 & 3 \\ 0 & 1 & 1 & 2 & 1 & 1 \\ 1 & 2 & 1 & 1 & 1 & 1 \\ 1 & 2 & 1 & 1 & 1 & 1 \end{vmatrix} \begin{matrix} 1^{\circ} (0.0.48) = 0 \\ 2^{\circ} (3.115.2) = 690 \\ 3^{\circ} (134.1.1) = 134 \\ 4^{\circ} (2.0.134) = 0 \\ 5^{\circ} (1.115.0) = 0 \\ 6^{\circ} (48.1.3) = 144 \end{matrix}$$

$$\begin{matrix} 824 \\ - \\ 144 \end{matrix}$$

$$D_2 = \underline{680}$$

$$\left. \begin{aligned} D_X &= 510/34 = \boxed{15 = X} \\ D_Y &= 612/34 = \boxed{18 = Y} \\ D_Z &= 680/34 = \boxed{20 = Z} \end{aligned} \right\} \begin{matrix} 15 + 18 + 20 = 53,00 \\ (L\epsilon r a^{\circ} A^{\circ}) \end{matrix}$$



$$|D| = \begin{vmatrix} 2 & 1 & 3 \\ 1 & 3 & 1 \\ 1 & 0 & 5 \end{vmatrix} \begin{matrix} 2^0 & 1^0 & 3^0 \\ 1^1 & 3^1 & 1^1 \\ 1^2 & 0^2 & 5^2 \end{matrix} \begin{matrix} 1^a(2 \cdot 3 \cdot (-5)) = -30 \\ 1^a(1 \cdot 3 \cdot (-3)) = -9 \\ 2^a((1) \cdot (-1) \cdot 1) = -1 \\ 2^a(0 \cdot (-1) \cdot 2) = 0 \\ 3^a((-3) \cdot 1 \cdot 0) = 0 \\ 3^a((-5) \cdot 1 \cdot (-1)) = 5 \end{matrix}$$

$$\begin{matrix} -29 & - & -4 \end{matrix}$$

$$D = -25$$

$$Dx = \begin{vmatrix} 5 & 1 & 3 \\ 1 & 3 & 1 \\ 1 & 0 & 5 \end{vmatrix} \begin{matrix} 5^0 & 1^0 & 3^0 \\ 1^1 & 3^1 & 1^1 \\ 1^2 & 0^2 & 5^2 \end{matrix} \begin{matrix} 1^a((5) \cdot 3 \cdot (-5)) = -75 \\ 1^a(3 \cdot 3 \cdot (-3)) = -27 \\ 2^a((1) \cdot (-1) \cdot 3) = -3 \\ 2^a(0 \cdot (-1) \cdot (-5)) = 0 \\ 3^a((-3) \cdot 1 \cdot 0) = 0 \\ 3^a((-5) \cdot 1 \cdot (-1)) = 5 \end{matrix}$$

$$\begin{matrix} 78 & - & 28 \end{matrix}$$

$$Dx = 50$$

$$D_x = \begin{vmatrix} 2 & -5 & -3 \\ 1 & 11 & -1 \\ 1 & 3 & 5 \end{vmatrix} \begin{vmatrix} 2 & 5 \\ 1 & 1 \\ 1 & 3 \end{vmatrix} \begin{matrix} 1^a (2, 11, (-5)) = -110 \\ 2^a ((-5), 11, 1) = 5 \\ 3^a ((-3), 1, 3) = -9 \end{matrix}$$

$$\begin{matrix} 1^a (1, 11, (-3)) = 23 \\ 2^a (3, (-1), 2) = -6 \\ 3^a ((-5), 1, (-5)) = 25 \end{matrix}$$

$$\begin{matrix} -110 \\ 5 \\ -9 \\ \hline -104 \end{matrix} \quad \begin{matrix} 23 \\ -6 \\ 25 \\ \hline -14 \end{matrix}$$

$$D_x = -100$$

$$D_z = \begin{vmatrix} 1 & -2 & 0 \\ 0 & 2 & 0 \\ 1 & 1 & 11 \end{vmatrix} \begin{vmatrix} 1 & 2 \\ 0 & 2 \\ 0 & 1 \end{vmatrix} \begin{matrix} 1^a (1, 2, 11) = 22 \\ 2^a ((-2), 0, 1) = 0 \\ 3^a (0, 0, 1) = 0 \end{matrix}$$

$$\begin{matrix} 1^a (1, 2, 0) = 0 \\ 2^a (1, 0, 1) = 0 \\ 3^a (11, 0, -2) = 0 \end{matrix}$$

$$\begin{matrix} 22 \\ 0 \\ 0 \\ \hline 22 \end{matrix}$$

$$D_z = 22$$

$$D_x = 66/11 = \boxed{6 = X} \quad 6 + (2 \cdot 3) + (3 \cdot 2)$$

$$D_y = 33/11 = \boxed{3 = X} \quad 6 + 6 + 6 = 18 \text{ (LETRA "B")}$$

$$D_z = 22/11 = \boxed{2 = X}$$

$$\text{III- } \begin{cases} x + y + z = 0 \\ 2x - y - 2z = 1 \\ 6x + 3z = -12 \end{cases} \begin{pmatrix} 1 & 1 & 1 & 0 \\ 2 & -1 & -2 & 1 \\ 0 & 6 & 3 & -12 \end{pmatrix} \begin{pmatrix} 0 & -3 & -4 & 1 \\ 0 & 6 & 3 & -12 \end{pmatrix}$$

$$N. (2) = \begin{pmatrix} 0 & -3 & -4 & 1 \\ 0 & 6 & 3 & -12 \end{pmatrix} \begin{pmatrix} 0 & -6 & -8 & 2 \\ 0 & 6 & 3 & -12 \end{pmatrix} \begin{matrix} -5z = -10 \\ z = -10/5 \\ z = 2 \\ \text{(LETRA "D")} \end{matrix}$$



V-

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

$$D = \begin{vmatrix} 2 & 1 & 0 \\ 2 & 0 & 1 \\ 3 & 2 & 1 \end{vmatrix} = 2(1 \cdot 1 - 0 \cdot 2) - 1(2 \cdot 1 - 0 \cdot 3) + 0(2 \cdot 2 - 3 \cdot 1) = 2(1) - 1(2) = 0$$

$$1^* (3 \cdot 2 \cdot 0) = 0$$

$$2^* (2 \cdot 1 \cdot 2) = 4$$

$$3^* (1 \cdot 0 \cdot 1) = 0$$

$$D = \boxed{3}$$

$$D_x = \begin{vmatrix} 5 & 1 & 0 \\ 3 & 2 & 1 \\ 7 & 2 & 1 \end{vmatrix} = 5(2 \cdot 1 - 0 \cdot 2) - 1(3 \cdot 1 - 0 \cdot 7) + 0(3 \cdot 2 - 7 \cdot 1) = 5(2) - 1(3) = 10 - 3 = 7$$

$$1^* (7 \cdot 2 \cdot 0) = 0$$

$$2^* (1 \cdot 1 \cdot 7) = 7$$

$$3^* (0 \cdot 3 \cdot 2) = 0$$

$$D_x = 7$$

$$D_x = \boxed{413}$$



$$D_y = \begin{vmatrix} 2 & 5 & 0 \\ 0 & 2 & 5 \\ 0 & 3 & 1 \end{vmatrix} \begin{matrix} 1^a(2.3.7) = 6 \\ 2^a(5.1.3) = 15 \\ 3^a(0.0.7) = 0 \end{matrix} \begin{matrix} 1^a(3.3.0) = 0 \\ 2^a(7.1.2) = 14 \\ 3^a(1.0.5) = 5 \end{matrix}$$

$$\underline{21} \quad \underline{14} \quad \underline{5}$$

$$\underline{D_y = 7/3}$$

$$D_z = \begin{vmatrix} 2 & 1 & 5 \\ 0 & 2 & 3 \\ 3 & 2 & 7 \end{vmatrix} \begin{matrix} 1^a(2.2.7) = 28 \\ 2^a(7.3.3) = 9 \\ 3^a(5.0.2) = 0 \end{matrix} \begin{matrix} 1^a(3.2.5) = 30 \\ 2^a(2.3.2) = 12 \\ 3^a(7.0.1) = 0 \end{matrix}$$

$$\underline{37} \quad \underline{42} \quad \underline{0}$$

$$\underline{D_z = -5/3}$$

$$V = \left\{ \left( \frac{4}{3}, \frac{7}{3}, \frac{-5}{3} \right) \right\} \text{ (Let's call it "D")}$$

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

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

$D_y = \begin{vmatrix} 2 & 2 \\ -1 & -3 \end{vmatrix} = -4/5$        $V = \{(3/5, -4/5)\}$

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

$D = \begin{vmatrix} 3 & -1 & 1 \\ 2 & 0 & 3 \\ 4 & 1 & -2 \end{vmatrix}$        $\begin{cases} 1^a (3 \cdot 0 \cdot 2) = 0 \\ 2^a (-1 \cdot 3 \cdot 4) = -12 \\ 3^a (1 \cdot 2 \cdot 1) = 2 \end{cases} \rightarrow -10$

$D_x = \begin{vmatrix} 3 & -1 & 1 \\ 2 & 0 & 3 \\ 4 & 1 & -2 \end{vmatrix}$        $\begin{cases} 1^a (4 \cdot 0 \cdot 1) = 0 \\ 2^a (1 \cdot 3 \cdot 3) = 9 \\ 3^a (2 \cdot 2 \cdot (-1)) = -4 \end{cases} \rightarrow 13$

$D = (-10 - (4 \cdot 13)) = -23$

$D_y = \begin{vmatrix} 3 & -1 & 1 \\ 2 & 0 & 3 \\ 4 & 1 & -2 \end{vmatrix}$        $\begin{cases} 1^a (3 \cdot (-1) \cdot (-2)) = 6 \\ 2^a (1 \cdot 3 \cdot 4) = 12 \\ 3^a (1 \cdot 2 \cdot 7) = 14 \end{cases} \rightarrow 32$

$D_z = \begin{vmatrix} 3 & -1 & 1 \\ 2 & 0 & 3 \\ 4 & 1 & -2 \end{vmatrix}$        $\begin{cases} 1^a (4 \cdot (-1) \cdot 1) = -4 \\ 2^a (7 \cdot 3 \cdot 3) = 63 \\ 3^a (-2 \cdot 2 \cdot 1) = -4 \end{cases} \rightarrow 55$

$D_x = -23 / -23 = 1$

$D_y = 32 / -23 = -1$

$D_z = 55 / -23 = -2$

$V = \{1, -1, -2\}$



$$Dx = \begin{vmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ 7 & 1 & 2 & 7 & 7 \end{vmatrix} \begin{matrix} 1^a (1, 0, (-2)) = 0 \\ 2^a ((-1), 3, 7) = -21 \\ 3^a (1, (-1), 1) = -1 \end{matrix} \left. \vphantom{\begin{vmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ 7 & 1 & 2 & 7 & 7 \end{vmatrix}} \right\} -22$$

$$1^a (7, 0, 1) = 0$$

$$Dx = -22 - (-1) = -23/0 \quad 2^a (1, 3, 1) = 3 \quad -1$$

$$Dx = -23/23 \quad 3^a ((-2), (-1), 1) = -2$$

$$\boxed{Dx = 1}$$

$$Dz = \begin{vmatrix} 3 & 1 & 1 & 3 & 1 \\ 2 & 0 & (-1) & 2 & 0 \\ 4 & 1 & 7 & 4 & 1 \end{vmatrix} \begin{matrix} 1^a (3, 0, 7) = 0 \\ 2^a ((-1), (-1), 4) = 4 \\ 3^a (1, 2, 1) = 2 \end{matrix} \left. \vphantom{\begin{vmatrix} 3 & 1 & 1 & 3 & 1 \\ 2 & 0 & (-1) & 2 & 0 \\ 4 & 1 & 7 & 4 & 1 \end{vmatrix}} \right\} 6$$

$$1^a (4, 0, 1) = 0$$

$$Dz = 6 - (-17) = 23/0 \quad 2^a (1, (-1), 3) = -3 \quad -17$$

$$Dz = 23/23 \quad 3^a (7, 2, (-1)) = -14$$

$$\boxed{Dz = -1}$$

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

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

$$\begin{array}{rcl} 3x + 4y - z = 1 & & -4x - 5y - 2z = -12 \\ + & & + \\ x - 2y + 3z = 8 & & 4x + 2y + 2z = 9 \end{array}$$

$$4x + 2y + 2z = 9$$

$$0 - 3y - 0 = -3$$

$$y = -3/-3$$

$$y = 1$$

(Letra "A")