

## V. Parte

### PROBLEMA 69

V. Resuelva el sistema dado usando la adjunta

$$69) \begin{cases} 7x_1 - 8x_2 = 3 \\ 9x_1 + 9x_2 = -8 \end{cases}$$
$$\begin{vmatrix} 7 & -8 \\ 9 & 9 \end{vmatrix} = 7(9) - (-8)(9) \\ = 63 - (-72) \\ = 63 + 72 \\ = 135$$
$$A_{11} = 9 \quad \begin{cases} A_{21} = -(-8) = 8 \\ A_{22} = 7 \end{cases} \quad \text{Adi} A = \begin{pmatrix} 9 & 8 \\ -9 & 7 \end{pmatrix}$$
$$A_{12} = -9$$
$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \frac{1}{135} \begin{pmatrix} 9 & 8 \\ -9 & 7 \end{pmatrix} \begin{pmatrix} 3 \\ -8 \end{pmatrix}$$
$$= \frac{1}{135} \begin{pmatrix} 27 - 64 \\ -27 + 56 \end{pmatrix} = \begin{pmatrix} \frac{-37}{135} \\ \frac{-83}{135} \end{pmatrix}$$
$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} \frac{-37}{135} \\ \frac{-83}{135} \end{pmatrix}$$

### PROBLEMA 70

$$70) \begin{cases} 3x_1 - x_2 = 0 \\ 4x_1 + 2x_2 = 5 \end{cases}$$

$$\begin{vmatrix} 3 & -1 \\ 4 & 2 \end{vmatrix} = (3)(2) - (-1)(4) \\ = 6 - (-4) \\ = 6 + 4 \\ = 10$$

$$A_{11} = 2 \quad \begin{cases} A_{21} = -(-1) = 1 \\ A_{12} = -4 \end{cases} \quad A_{22} = 3 \quad \text{Adj } A = \begin{pmatrix} 2 & -1 \\ -4 & 3 \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \frac{1}{10} \begin{pmatrix} 2 & -1 \\ -4 & 3 \end{pmatrix} \begin{pmatrix} 0 \\ 5 \end{pmatrix} \\ = \frac{1}{10} \begin{pmatrix} 0 + 5 \\ 0 + 15 \end{pmatrix} = \begin{pmatrix} \frac{5}{10} \\ \frac{15}{10} \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ \frac{3}{2} \end{pmatrix} \text{ la solución del Sistema es } x_1 = \frac{1}{2}, x_2 = \frac{3}{2}$$

Escaneado con CamScanner

PROBLEMA 71

$$71) \begin{cases} 2x_1 + x_2 + x_3 = 6 \\ 3x_1 - 2x_2 - 3x_3 = 5 \\ 8x_1 + 2x_2 + 5x_3 = 11 \end{cases}$$

$$\begin{pmatrix} 2 & 1 & 1 \\ 3 & -2 & -3 \\ 8 & 2 & 5 \end{pmatrix} \begin{array}{l} = 2(-4) - 1(39) + 1(22) \\ = -8 - 39 + 22 \\ = -25 \end{array}$$

$$\begin{array}{l} A_{11} = -4 \\ A_{12} = -39 \\ A_{13} = 22 \end{array} \begin{array}{l} A_{21} = -3 \\ A_{22} = 2 \\ A_{23} = -(-4) = 4 \end{array} \begin{array}{l} A_{31} = -1 \\ A_{32} = -(-9) = 9 \\ A_{33} = -7 \end{array} \quad \text{Ad, } A = \begin{pmatrix} -4 & -3 & -1 \\ -39 & 2 & 9 \\ 22 & 4 & -7 \end{pmatrix}$$

$$\begin{aligned} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} &= \frac{1}{-25} \begin{pmatrix} -4 & -3 & -1 \\ -39 & 2 & 9 \\ 22 & 4 & -7 \end{pmatrix} \begin{pmatrix} 6 \\ 5 \\ 11 \end{pmatrix} \\ &= \frac{1}{-25} \begin{pmatrix} -24 - 15 - 11 \\ -234 + 10 + 99 \\ 132 + 20 - 77 \end{pmatrix} = \begin{pmatrix} \frac{-50}{-25} \\ \frac{-125}{-25} \\ \frac{75}{-25} \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ 5 \\ -3 \end{pmatrix} \quad \text{la solución del sistema es } x_1 = 2, x_2 = 5 \text{ y } x_3 = -3.$$

$$\begin{cases} -5x_1 + 8x_2 + 10x_3 = -8 \\ x_2 - 2x_3 = -2 \\ 10x_1 + 10x_2 + 6x_3 = 9 \end{cases}$$

$$\begin{pmatrix} -5 & 8 & 10 \\ 0 & 1 & -2 \\ 10 & 10 & 6 \end{pmatrix} \begin{array}{l} \\ -1(-52) = 7(-130) \\ = 52 + 910 \\ = 962 \end{array}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \frac{1}{962} \begin{pmatrix} -42 & 52 & 70 \\ -6 & -130 & 10 \\ 80 & 130 & 27 \end{pmatrix} \begin{pmatrix} -8 \\ -2 \\ 9 \end{pmatrix} = \frac{1}{962} \begin{pmatrix} 336 - 104 - 630 \\ 48 - 260 - 90 \\ -640 - 260 - 243 \end{pmatrix} = \begin{pmatrix} \frac{362}{962} \\ \frac{398}{962} \\ \frac{-667}{962} \end{pmatrix} = \begin{pmatrix} \frac{181}{481} \\ \frac{199}{481} \\ \frac{-667}{962} \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} \frac{181}{481} \\ \frac{199}{481} \\ \frac{-667}{962} \end{pmatrix}$$
 La solución del sistema es  $x_1 = \frac{181}{481}$ ,  $x_2 = \frac{199}{481}$ ,  $x_3 = \frac{-667}{962}$

$$\begin{cases} 2x_1 + 2x_2 + x_3 = 7 \\ x_1 + 2x_2 + x_3 = 0 \\ -x_1 + x_3 + 3x_3 = 1 \end{cases}$$

$$\begin{pmatrix} 2 & 2 & 1 \\ 1 & 2 & 1 \\ -1 & 1 & 3 \end{pmatrix} \begin{array}{l} = 2(5) - 2(4) + 1(3) \\ = 10 - 8 + 3 \\ = 5 \end{array}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \frac{1}{5} \begin{pmatrix} 5 & -5 & 0 \\ -4 & 7 & -1 \\ 3 & -4 & 2 \end{pmatrix} \begin{pmatrix} 7 \\ 0 \\ 1 \end{pmatrix} = \frac{1}{5} \begin{pmatrix} 35 & 0 & 0 \\ -28 & 0 & -1 \\ 21 & 0 & 2 \end{pmatrix} = \begin{pmatrix} \frac{35}{5} \\ \frac{-28}{5} \\ \frac{21}{5} \end{pmatrix} = \begin{pmatrix} 7 \\ \frac{-28}{5} \\ \frac{21}{5} \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 7 \\ \frac{-28}{5} \\ \frac{21}{5} \end{pmatrix}$$
 La solución del sistema es  $x_1 = 7$ ,  $x_2 = \frac{-28}{5}$ ,  $x_3 = \frac{21}{5}$

PROBLEMA 74

74) 
$$\begin{cases} 2x_1 + 5x_2 + x_3 = -1 \\ 4x_1 + x_2 + 3x_3 = 3 \\ -2x_1 + 2x_2 = 0 \end{cases}$$

$$\begin{matrix} A_{11} = -6 & A_{21} = -2 & A_{31} = 16 \\ A_{12} = -6 & A_{22} = -2 & A_{32} = -10 \\ A_{13} = 10 & A_{23} = -14 & A_{33} = -18 \end{matrix}$$

$$\begin{vmatrix} 2 & 5 & -1 \\ 4 & 1 & 3 \\ -2 & 2 & 0 \end{vmatrix} = -2(16) - 2(10) = -32 - 20 = -52$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = -\frac{1}{-52} \begin{pmatrix} -6 & -2 & 16 \\ -6 & -2 & -10 \\ 10 & -14 & -18 \end{pmatrix} \begin{pmatrix} -1 \\ 3 \\ 0 \end{pmatrix} = -\frac{1}{-52} \begin{pmatrix} 6 & -6 & 0 \\ 6 & -6 & 0 \\ -10 & -42 & 0 \end{pmatrix} = \begin{pmatrix} -\frac{0}{52} \\ -\frac{0}{52} \\ -\frac{52}{52} \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$
 La solución del sistema es  $x_1 = 0, x_2 = 0, x_3 = 1$

Problema 75

$$75) \begin{cases} 6x_1 - 10x_2 + 4x_3 = -2 \\ 10x_1 + 7x_2 + 5x_3 = 3 \\ 3x_1 + 9x_2 + 5x_3 = -7 \end{cases}$$

$$\begin{aligned} 6 - 10 + 4 &= 6(-10) + 10(35) + 4(69) \\ -10 + 7 + 5 &= -60 + 350 + 276 \\ 3 + 9 + 5 &= 566 \end{aligned}$$

$$A_{11} = -10 \quad A_{21} = -(-86) = 86 \quad A_{31} = -78$$

$$A_{12} = -(35) = -35 \quad A_{22} = 18 \quad A_{32} = -(-10) = 10$$

$$A_{13} = 69 \quad A_{23} = -(84) = -84 \quad A_{33} = 142$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \frac{1}{566} \begin{pmatrix} -10 & 86 & -78 \\ -35 & 18 & 10 \\ 69 & -84 & 142 \end{pmatrix} \begin{pmatrix} -2 \\ 3 \\ -7 \end{pmatrix}$$

$$\frac{1}{566} \begin{pmatrix} 20 & 258 & 546 \\ 70 & 54 & -70 \\ -138 & -252 & -994 \end{pmatrix} = \begin{pmatrix} 824 \\ 54 \\ -1384 \end{pmatrix} = \begin{pmatrix} \frac{824}{566} \\ \frac{54}{566} \\ \frac{-1384}{566} \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} \frac{412}{283} \\ \frac{27}{283} \\ \frac{-692}{283} \end{pmatrix}$$

$$x_1 = \frac{412}{283}$$

$$x_2 = \frac{27}{283}$$

$$x_3 = \frac{-692}{283}$$

Problema 76

$$76) \begin{cases} x_1 + x_2 + x_3 + x_4 = 6 \\ 2x_1 - x_3 - x_4 = 4 \\ x_2 + 3x_3 + 6x_4 = 3 \\ -x_4 = 5 \end{cases}$$

$$\begin{aligned} 1 + 1 + 1 + 1 &= 1(0) - 1(-9) + 1(0) - 1(0) \\ 2 \ 0 \ -1 \ -1 &= 0 + 9 + 0 - 0 \\ 0 \ 0 \ 3 + 6 &= 9 \\ 1 \ 0 \ 0 \ -1 &= 9 \end{aligned}$$

$$A_{11} = 0 \quad A_{21} = -(-3) = 3 \quad A_{31} = 1 \quad A_{41} = -(-3) = 3$$

$$A_{12} = -(-9) = 9 \quad A_{22} = 0 \quad A_{32} = -(-3) = 3 \quad A_{42} = -9$$

$$A_{13} = 0 \quad A_{23} = -(6) = -6 \quad A_{33} = 1 \quad A_{43} = -(-13) = 13$$

$$A_{14} = 0 \quad A_{24} = 3 \quad A_{34} = -(-1) = 1 \quad A_{44} = -6$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \frac{1}{9} \begin{pmatrix} 0 & 3 & 1 & 3 \\ 9 & 0 & -3 & -9 \\ 0 & -6 & 1 & 13 \\ 0 & 3 & 1 & -6 \end{pmatrix} \begin{pmatrix} 6 \\ 4 \\ 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 0 + 12 + 3 + 15 \\ 54 + 0 - 9 - 45 \\ 0 - 24 + 3 + 60 \\ 0 + 12 + 3 - 30 \end{pmatrix} = \begin{pmatrix} 30 \\ 0 \\ 39 \\ -15 \end{pmatrix}$$

$$= \begin{pmatrix} \frac{30}{9} \\ \frac{0}{9} \\ \frac{39}{9} \\ \frac{-15}{9} \end{pmatrix} = \begin{pmatrix} \frac{10}{3} \\ 0 \\ \frac{13}{3} \\ \frac{-5}{3} \end{pmatrix}$$

$$x_1 = \frac{10}{3}$$

$$x_2 = 0$$

$$x_3 = \frac{13}{3}$$

$$x_4 = \frac{-5}{3}$$

# Problema 77

$$77) \begin{cases} x_1 - x_4 = 7 \\ 2x_2 + x_3 = 2 \\ 4x_1 + x_2 = -3 \\ 3x_3 - 5x_4 = 2 \end{cases}$$

$$\begin{array}{r|l} 1 & 0 & 0 & -1 \\ 0 & 2 & 1 & 0 \\ 4 & 1 & 0 & 0 \\ 0 & 0 & 3 & -5 \end{array} \begin{array}{l} = 1(5) - 0(20) + 0(40) + 1(-24) \\ = -19 \end{array}$$

$$\begin{array}{ll} A_{11} = 5 & A_{21} = -(-3) = 3 \\ A_{31} = -6 & A_{41} = -(1) = -1 \\ A_{12} = -(20) - 20 & A_{22} = -12 \\ A_{32} = -(-5) = 5 & A_{42} = 4 \\ A_{13} = 40 & A_{23} = -(-5) = 5 \\ A_{33} = -10 & A_{43} = -(8) = -8 \\ A_{14} = -(24) = -24 & A_{24} = 3 \\ A_{34} = -(6) = -6 & A_{44} = -1 \end{array}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \frac{1}{-19} \begin{pmatrix} 5 & 3 & -6 & -1 \\ -20 & -12 & 5 & 4 \\ 40 & 5 & -10 & -8 \\ 24 & 3 & -6 & -1 \end{pmatrix} \begin{pmatrix} 7 \\ 2 \\ -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 35 & 6 & 18 & -2 \\ -140 & -24 & -15 & 8 \\ 280 & 10 & 30 & -16 \\ 168 & 6 & 18 & -2 \end{pmatrix}$$

$$\begin{pmatrix} 57 \\ -171 \\ 304 \\ 190 \end{pmatrix} = \begin{pmatrix} \frac{57}{-19} \\ \frac{-171}{-19} \\ \frac{304}{-19} \\ \frac{190}{-19} \end{pmatrix} = \begin{pmatrix} -3 \\ 9 \\ -16 \\ -10 \end{pmatrix} \begin{array}{l} x_1 = -3 \\ x_2 = 9 \\ x_3 = -16 \\ x_4 = -10 \end{array}$$