Lista 2 - G. A.

1- a) $\begin{vmatrix} 1 & 2 \\ -4 & 3 \end{vmatrix} \rightsquigarrow 1 \cdot a_{11} + 2 \cdot a_{12}$

$1 \cdot (-1)^{1+1} \cdot D_{11} + 2 \cdot (-1)^{1+2} \cdot D_{12}$

$1 \cdot 3 + (-2) \cdot -4 = 3 + 8 = 11 \rightarrow Det = 11$

b) $\begin{vmatrix} \sqrt{2} & 3\sqrt{6} \\ 2 & \sqrt{3} \end{vmatrix} \rightsquigarrow 3\sqrt{6} \cdot c^{1+2} + \sqrt{3} \cdot c^{2+1}$

$3\sqrt{6} \cdot (-1)^{1+2} \cdot D_{12} + \sqrt{3} \cdot (-1)^{2+1} \cdot D_{21}$

$-3\sqrt{6} \cdot 2 + \sqrt{3} \cdot \sqrt{2}$

$-6\sqrt{6} - \sqrt{6} = -6 \rightarrow Det = -6$

c) $\begin{vmatrix} \pi & 0 & 2 \\ 5 & -1 & 1 \\ 1 & 0 & 0 \end{vmatrix} \quad 1 \cdot c^{31} + 0 \cdot c^{32} + 0 \cdot c^{33}$

$1 \cdot D_{31} = 1 \cdot \begin{vmatrix} 0 & 2 \\ -1 & 1 \end{vmatrix} + 2 + 0 \rightarrow Det = 2$

d) $\begin{vmatrix} -2 & 1 & -1 \\ 1 & 5 & 4 \\ -3 & 4 & 2 \end{vmatrix} \quad -2 \cdot c^{11} + 1 \cdot c^{12} + (-1) \cdot c^{13}$

$-2 \cdot D_{11} + 1 \cdot D_{12} + (-1) \cdot D_{13}$

$-2 \cdot \begin{vmatrix} 5 & 4 \\ 4 & 2 \end{vmatrix} + 1 \cdot \begin{vmatrix} 1 & 4 \\ -3 & 2 \end{vmatrix} + (-1) \cdot \begin{vmatrix} 1 & 5 \\ -3 & 4 \end{vmatrix}$

16 10 12 2 15 4

$-2 \cdot -16 + 10 + 12 + 2 + (-19)$

$DET = 56 - 19 = 37$

e) $\begin{vmatrix} 0 & 2 & 0 \\ 1 & 3 & 5 \\ 2 & -1 & 2 \end{vmatrix} \quad 0 \cdot c^{11} + 2 \cdot c^{12} + 0 \cdot c^{13}$

$2 \cdot \begin{vmatrix} 1 & 5 \\ 2 & 2 \end{vmatrix} + 2 - 10$ $\rightarrow DET = 15 - 16 =$

$+15$

f) $\begin{vmatrix} 3 & -1 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & -1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{vmatrix} \quad 3 \cdot c^{11} + 0 \cdot c^{21} + 0 \cdot c^{31} + 0 \cdot c^{41}$

$3 \cdot D_{11} \rightsquigarrow 3 \cdot \begin{vmatrix} 1 & 0 & 1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{vmatrix} \begin{matrix} 1 & 0 \\ -1 & 1 \\ 0 & 1 \end{matrix} \rightsquigarrow 3 \cdot 0 = 0$

0 0 0 1 0 -1

g) $\begin{array}{ccccc} 1 & 0 & 0 & 0 & 0 \\ 5 & 1 & 2 & 6 & 3 \\ 7 & 2 & \sqrt{5} & 0 & 0 \\ 10 & 3 & 6 & 1 & 0 \\ -2 & -3 & 0 & 0 & 0 \end{array}$ $1 \cdot c^{11} + 0 \cdot 0 \cdot 0 \cdot 0$ $1 \cdot D11 \rightsquigarrow 1 \cdot \begin{array}{cccc} 1 & 2 & 6 & 3 \\ 2 & \sqrt{5} & 0 & 0 \\ 3 & 6 & 1 & 0 \\ -3 & 0 & 0 & 0 \end{array}$ $\rightarrow -3 \cdot c^{41} + 0 \; 0 \; 0$ $3 \cdot \begin{array}{ccc|cc} 2 & 6 & 3 & 2 & 6 \\ \sqrt{5} & 0 & 0 & \sqrt{5} & 0 \\ 6 & 1 & 0 & 6 & 1 \end{array}$

$0 \; 0 \; 0 + 0 \; 0 \; 3\sqrt{5}$

$1 \cdot 9\sqrt{5} \rightsquigarrow Det = 9\sqrt{5}$

h) $\begin{array}{ccccc} 3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -2 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & -2 & 0 & 0 & 0 \end{array}$ $3 \cdot c^{11} + 0 \cdot 0 \cdot 0 \cdot 0$ $3 \cdot D11 \rightsquigarrow 3 \cdot \begin{array}{cccc} 0 & 0 & 0 & -2 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -2 & 0 & 0 & 0 \end{array}$ $\rightarrow -2 \cdot c^{41} + 0 \cdot 0 \cdot 0$ $2 \cdot \begin{array}{ccc|cc} 0 & 0 & -2 & 0 & 0 \\ 2 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{array}$

$0 \; 0 \; 0 + 0 \; 0 \; -4$

$DET = 3 \cdot 2 \cdot (-4) = -24$

2 - a) $\begin{array}{ccc|cc} 7 & -2 & 14 & 7 & -2 \\ 3 & 2 & 10 & 3 & 2 \\ 4 & -8 & 2 & 4 & -8 \end{array}$ $\rightsquigarrow -112 + 560 + 12 + 28 - 80 - 336$

$DET = 72$

b) $\begin{array}{ccc} 3 & -5 & 7 \\ 4 & 2 & 8 \\ 1 & -9 & 6 \end{array} \cdot \begin{array}{ccc} 4 & 3 & 7 \\ -1 & 0 & 2 \\ 3 & 1 & -4 \end{array} = \begin{array}{ccc} 3 \cdot 4 + -5 \cdot -1 + 7 \cdot 3 & 3 \cdot 3 + -5 \cdot 0 + 7 \cdot 1 & 3 \cdot 7 + -5 \cdot 2 + \\ 4 \cdot 4 + 2 \cdot -1 + 8 \cdot 3 & 4 \cdot 3 + 2 \cdot 0 + 8 \cdot 1 & 4 \cdot 7 + 2 \cdot 2 + 8 \\ 1 \cdot 4 + -9 \cdot -1 + 6 \cdot 3 & 1 \cdot 3 + -9 \cdot 0 + 6 \cdot 1 & 1 \cdot 7 + -9 \cdot 2 + \end{array}$

Det $\begin{array}{ccc|cc} 38 & 16 & -17 & 38 & 16 \\ 38 & 20 & 0 & 38 & 20 \\ 31 & 9 & -35 & 31 & 9 \end{array}$ $\rightsquigarrow$

$\rightarrow 38 \cdot (20 \cdot (-35) - 0 \cdot 9) - 16 \cdot (38 \cdot (-35) - 0 \cdot 31) + (-17) \cdot (38 \cdot 9 - 20 \cdot 31)$

$38 \cdot (-700) - 16 \cdot (-1330) + (-17) \cdot (342 - 620)$

$-26600 + 21280 + (-17) \cdot (-278)$

$-26600 + 21280 + 4726$

-594

c) $Det(B^t A^t) = Det(A^t B^t) = Det(AB) \rightsquigarrow -594$

d) $3A = \begin{vmatrix} 9 & -15 & 21 \\ 12 & 6 & 24 \\ 3 & -27 & 18 \end{vmatrix} \quad -2C = \begin{vmatrix} -4 & -6 & 2 \\ -12 & -18 & 4 \\ -16 & -24 & 6 \end{vmatrix}$

$3A - 2C + B = \begin{vmatrix} 9-4+4 & -15-6+3 & 21+2+7 \\ 12-12-1 & 6-18+0 & 24+4+2 \\ 3-16+3 & -27-24+1 & 18+6-4 \end{vmatrix} = \begin{vmatrix} 9 & -18 & 30 \\ -1 & -12 & 30 \\ -10 & -50 & 20 \end{vmatrix}$

$Det = 9 \cdot (-12 \cdot 20 - 30 \cdot (-50)) - (-18) \cdot (-1 \cdot 20 - 30 \cdot (-10)) + 30 \cdot (-1 \cdot (-50) - (-12) \cdot (-10))$

$9 \cdot (-240 + 1500) + 18 \cdot (-20 + 300) + 30 \cdot (50 - 120)$

$9 \cdot (1260) + 18 \cdot 280 + 30 \cdot (-70)$

$11340 + 5040 - 2100$

14280

e) $C^t = \begin{vmatrix} 2 & 6 & 8 \\ 3 & 9 & 12 \\ -1 & -2 & -3 \end{vmatrix} \quad AC^t = \begin{vmatrix} 3 \cdot 2 + (-5) \cdot 3 + 7 \cdot (-1) & 3 \cdot 6 + (-5) \cdot 9 + 7 \cdot (-2) & (3 \cdot 8) + (-5) \cdot 12 + 7 \cdot (-3) \\ 4 \cdot 2 + 2 \cdot 3 + 8 \cdot (-1) & 4 \cdot 6 + 2 \cdot 9 + 8 \cdot (-2) & 4 \cdot 8 + 2 \cdot 12 + 8 \cdot (-3) \\ 1 \cdot 2 + (-9) \cdot 3 + 6 \cdot (-1) & 1 \cdot 6 + (-9) \cdot 9 + 6 \cdot (-2) & 1 \cdot 8 + (-9) \cdot 12 + 6 \cdot (-3) \end{vmatrix}$

$AC^t = \begin{vmatrix} 6-15-7 & 18-45-14 & 24-60-21 \\ 8+6-8 & 24+18-16 & 32+24-24 \\ 2-27-6 & 6-81-12 & 8-108-18 \end{vmatrix} = \begin{vmatrix} -16 & -41 & -57 \\ 6 & 26 & 32 \\ -31 & -87 & -118 \end{vmatrix} \begin{matrix} -16 & -41 \\ 6 & 26 \\ -31 & -87 \end{matrix}$

$Det = -16 \cdot (26 \cdot (-118) - 32 \cdot (-87)) - (-41) \cdot (6 \cdot (-118) - 32 \cdot (-31)) + (-57) \cdot (6 \cdot (-87) \ldots$

$-16 \cdot (-3068 + 2784) + 41 \cdot (-708 + 992) - 57 (-522 + 806)$

$-16 \cdot (-284) + 41 \cdot 284 - 57 \cdot 284$

$4544 + 11644 - 16188 = 0$

3-a) $\det(A^t) = \det(A) = -2$

b) Por escalar: $\det = k^n$ $\quad \det(6A) = 6^4 \cdot \det(A) = 1296 \cdot (-2) = -2592$

$k = 6$ e $n = 4$

c) $\det(A^7) = (\det(A))^7 = (-2)^7 = -128$

d) $\det(A^{-1}) = \dfrac{1}{\det(A)} = \dfrac{1}{-2} = \dfrac{-1}{2}$

4-a) $\begin{vmatrix} a & b & c \\ d & e & f \\ 4g & 4h & 4i \end{vmatrix} = 4 \cdot \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 4 \cdot -3 = -12$

b) $\begin{vmatrix} a & b & -2c \\ 3d & 3e & -6f \\ g & h & -2i \end{vmatrix} = -6 \cdot \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = (-6)(-3) = 18$

c) $\begin{vmatrix} -a & -b & -c \\ d & e & f \\ g & -h & -i \end{vmatrix} = (-1) \cdot (-1) \cdot \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 1 \cdot -3 = -3$

d) $\begin{vmatrix} g & h & i \\ a & b & c \\ d & e & f \end{vmatrix} = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = -3$

e) $\begin{vmatrix} a & b & c \\ 2d+a & 2e+b & 2f+c \\ g & h & i \end{vmatrix} = 2 \cdot \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = -6$

f) $\begin{vmatrix} ka+a & kb+b & ck+c \\ d & e & f \\ g & h & i \end{vmatrix} = (k+1) \cdot \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = (k+1) \cdot 3$

5- A) $\begin{vmatrix} 10 & 8 & 40 & -2 \\ 4 & 6 & 20 & -4 \\ -5 & -7 & -30 & 1 \\ 3 & -6 & -30 & 12 \end{vmatrix} = 2 \cdot 2 \cdot 3 \begin{vmatrix} 5 & 4 & 20 & -1 \\ 2 & 3 & 10 & -2 \\ -5 & -7 & -30 & 1 \\ 1 & -2 & -30 & 4 \end{vmatrix} = 12 \cdot 10 \begin{vmatrix} 5 & 4 & 2 & -1 \\ 2 & 3 & 1 & -2 \\ -5 & -7 & -3 & 1 \\ 1 & -2 & -3 & 4 \end{vmatrix}$

$120 \cdot \begin{vmatrix} 5 & 4 & 2 & 1 \\ 2 & 3 & 1 & -2 \\ -5 & -7 & -3 & 1 \\ 1 & -2 & -1 & 4 \end{vmatrix}$

6-a) $\begin{vmatrix} 4 & 6 & x \\ 7 & 4 & 2x \\ 5 & 2 & -x \end{vmatrix} = -128 \qquad x = -2$

$\det = 4 \cdot (4 \cdot (-x) - 2x \cdot 2) - 6 \cdot (7 \cdot (-x) - 2x \cdot 5) + x\,(7 \cdot 2 - 4 \cdot 5)$

$4 \cdot (-4x - 4x) - 6 \cdot (-7x - 10x) + x\,(14 - 20)$

$4 \cdot (-8x) - 6\,(-17x) + x\,(-6)$

$-32x + 102x - 6x = 64x$

$64x = -128$

$x = \dfrac{-128}{64} \leadsto x = -2$

b) $\begin{vmatrix} 3 & 5 & 7 \\ 2x & x & 3x \\ 4 & 6 & 7 \end{vmatrix} = 39 \quad e \quad x = 3$

$\det = 3 \cdot (x \cdot 7 - 3x \cdot 6) - 5 \cdot (2x \cdot 7 - 3x \cdot 4) + 7 \cdot (2x \cdot 6 - x \cdot 4)$

$3 \cdot (7x - 18x) - 5 \cdot (14x - 12x) + 7\,(12x - 4x)$

$3 \cdot (-11x) - 5 \cdot (2x) + 7 \cdot (8x)$

$-33x - 10x + 56x = 13x$

Jandaia $13x = 39 \leadsto x = 3$

c) $\begin{vmatrix} x+3 & x+1 & x+4 \\ 4 & 5 & 1 \\ 9 & 10 & 7 \end{vmatrix} = -7$ é $x = 1$

$det = (x+3)\cdot(5\cdot 7 - 1\cdot 10) - (x+1)\cdot(4\cdot 7 - 1\cdot 9) + (x+4)\cdot(4\cdot 10 - 5\cdot 9)$

$(x+3)\cdot(5) - (x+1)\cdot(1) + (x+4)\cdot(-5)$

$5x + 15 - x - 1 - 5x - 20$

$-x - 6$

$-6x - 6 = -7$

$-x = -1$

$x = 1$

d) $\begin{vmatrix} x & x+2 \\ 1 & x \end{vmatrix}$ é singular $x = 2$ ou $x = -1$

$D = 0$

$det = x\cdot x - (x+2)\cdot 1 \rightarrow det = x^2 - x - 2$

$x^2 - x - 2 = 0$

$(x-2)(x+1) = 0 \rightarrow x = 2$ ou $x = -1$

e) $\begin{vmatrix} x-4 & 0 & 3 \\ 2 & 0 & x-9 \\ 0 & 3 & 0 \end{vmatrix}$ é inversível $x \neq 3$ ou $x \neq 10$

$\rightarrow det \neq 0$

$det = (x-4)\cdot(0\cdot 0 - (x-9)\cdot 3) - 0\cdot(2\cdot 0 - (x-9)\cdot 0) + 3\cdot(2\cdot 3 - 0\cdot 0) = (x-4) \rightarrow$

$\cdot(-3(x-9)) + 3\cdot 6 = -3(x-4)(x-9) + 18 = 0 \rightarrow (x-4)(x-9) = 6$

$x^2 - 13x + 36 = 6 \rightarrow x^2 - 13x + 30 = 0 \rightarrow (x-10)(x-3) = 0$

$x = 10 \quad x = 3$

7- a) $A^{-1} = \frac{1}{det_A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ $\quad det_A = ad - bc$

A inversa só existe se $Det(A) \neq 0$, $ad - bc \neq 0$

$$C = \begin{vmatrix} -3 & 1 & 1 \\ -2 & -2 & -2 \\ -2 & -2 & 6 \end{vmatrix}$$

9 - a) $A^{-1} = \dfrac{1}{\det(A)} \cdot adj(A)$ $\quad \det(A) = 2 \cdot 1 - (-2) \cdot 3 = 2 + 6 = 8$

$$C = \begin{vmatrix} 1 & -3 \\ 2 & 2 \end{vmatrix} \quad adj(A) = C^t = \begin{vmatrix} 1 & 2 \\ -3 & 2 \end{vmatrix}$$

$$A^{-1} = \frac{1}{8} \cdot \begin{vmatrix} 1 & 2 \\ -3 & 2 \end{vmatrix} \rightarrow A^{-1} = \begin{vmatrix} 1/8 & 1/4 \\ -3/8 & 1/4 \end{vmatrix}$$

b) $\det(B) = 2 \cdot (2 \cdot (-1) - 1 \cdot 1) - (-2) \cdot (1(-1) - 1 \cdot 0) + 0 \cdot (1 \cdot 1 - 2 \cdot 0)$

$\det(B) = 2 \cdot (-3) + 2 \cdot (-1) + 0 \cdot (1) = -6 - 2 + 0 = -8$

$$C = \begin{vmatrix} -3 & 1 & 1 \\ -2 & -2 & -2 \\ -2 & -2 & -6 \end{vmatrix} \quad adj(B) = C^t = \begin{vmatrix} -3 & -2 & -2 \\ 1 & -2 & -2 \\ 1 & -2 & 6 \end{vmatrix} \quad B^{-1} = \frac{1}{-8} \cdot \begin{vmatrix} -3 & -2 & -2 \\ 1 & -2 & -2 \\ 1 & -2 & 6 \end{vmatrix}$$

$$\begin{vmatrix} -3/8 & -2/8 & -2/8 \\ 1/8 & -2/8 & -2/8 \\ 1/8 & -2/8 & -2/8 \end{vmatrix}$$

c) $\det(C) = 0 \cdot (0 \cdot 0 - (-1) \cdot 1) - (-1) \cdot (2 \cdot 0 - (1) \cdot 1) + 1 \cdot (2 \cdot 1 - 0 \cdot 1)$

$0 \cdot (0+1) + 1 \cdot (0+1) + 1 \cdot (2-0)$

$\det(C) = 0 + 1 + 2 = 3$

$$C = \begin{vmatrix} 1 & 1 & 2 \\ 1 & -1 & 1 \\ 1 & 1 & 2 \end{vmatrix} \quad adj(C) = C^t = \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 2 & 1 & 2 \end{vmatrix}$$

$$C^{-1} = \frac{1}{3} \cdot \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 2 & 1 & 2 \end{vmatrix} = \begin{vmatrix} 1/3 & 1/3 & 1/3 \\ 1/3 & -1/3 & 1/3 \\ 2/3 & 1/3 & 2/3 \end{vmatrix}$$

10 - a) $XB = C - 2A^t$

$X = (C - 2A^t)B^{-1}$

A matriz B deve ser inversível, $\det(B) \neq 0$. Caso contrário, a inversa B^{-1} não existe, assim a solução para X não é possível.

b) $A^t = \begin{vmatrix} 1 & 2 & 0 \\ 0 & 3 & -1 \\ -1 & 0 & 2 \end{vmatrix}$ $\quad 2A^t \begin{vmatrix} 2 & 4 & 0 \\ 0 & 6 & -2 \\ -2 & 0 & 4 \end{vmatrix}$

$C - 2A^t \begin{vmatrix} 4 & 4 & 0 \\ 0 & 6 & -2 \\ -2 & 0 & 6 \end{vmatrix} - \begin{vmatrix} 2 & 4 & 0 \\ 0 & 6 & -2 \\ -2 & 0 & 4 \end{vmatrix} = \begin{vmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{vmatrix}$

$\det(B) = 3 \cdot (-1 \cdot 3 - 5 \cdot 0) - (-2) \cdot (2 \cdot 3 - 5 - 1) + 6 \cdot (2 \cdot 0 - (-1) \cdot 1)$

$\det(B) = -9 + 2 + 6 = -1$

Matriz dos cofatores de $B = C_B = \begin{vmatrix} -3 & -1 & 1 \\ 6 & 3 & -2 \\ -4 & -3 & 1 \end{vmatrix}$

$adj(B) = C_B^t = \begin{vmatrix} -3 & 6 & -4 \\ -1 & 3 & -3 \\ 1 & -2 & 1 \end{vmatrix}$ $\quad B^{-1} = \frac{1}{-1} \cdot \begin{vmatrix} -3 & 6 & -4 \\ -1 & 3 & -3 \\ 1 & -2 & 1 \end{vmatrix} = \begin{vmatrix} 3 & -6 & 4 \\ 1 & -3 & 3 \\ -1 & 2 & -1 \end{vmatrix}$

$X = (C - 2A^t)B^{-1} \rightarrow X = \begin{vmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{vmatrix} \cdot \begin{vmatrix} 3 & -6 & 4 \\ 1 & -3 & 3 \\ -1 & 2 & -1 \end{vmatrix}$

$$= \begin{vmatrix} 2 \cdot 3 + 0 \cdot 1 + 0 \cdot (-1) & 2 \cdot (-6) + 0 \cdot (-3) + 0 \cdot 2 & 2 \cdot 4 + 0 \cdot 3 + 0 \cdot (-1) \\ 0 \cdot 3 + 2 \cdot 1 + 0 \cdot (-1) & 0 \cdot (-6) + 2 \cdot (-3) + 0 \cdot 2 & 0 \cdot 4 + 2 \cdot 3 + 0 \cdot (-1) \\ 0 \cdot 3 + 0 \cdot 1 + 2 \cdot (-1) & 0 \cdot (-6) + 0 \cdot (-3) + 2 \cdot 2 & 0 \cdot 4 + 0 \cdot 3 + 2 \cdot (-1) \end{vmatrix}$$

$$X = \begin{vmatrix} 6 & -12 & 8 \\ 2 & -6 & 6 \\ -2 & 4 & -2 \end{vmatrix}$$

Tandaia

b) $A^{-1} = \frac{1}{1}\begin{vmatrix} 2 & -1 \\ -5 & 3 \end{vmatrix}$ $B^{-1} = \frac{1}{1}\begin{vmatrix} 2 & -7 \\ -1 & 4 \end{vmatrix}$

$AB = \begin{vmatrix} 3 & 1 \\ 5 & 2 \end{vmatrix} \begin{vmatrix} 4 & 7 \\ 1 & 2 \end{vmatrix} = \begin{vmatrix} 3\cdot 4 + 1\cdot 1 & 3\cdot 7 + 1\cdot 2 \\ 5\cdot 4 + 2\cdot 1 & 5\cdot 7 + 2\cdot 2 \end{vmatrix} = \begin{vmatrix} 13 & 23 \\ 22 & 39 \end{vmatrix}$

$\det(AB) = 13 \cdot 39 - 23 \cdot 22 = 507 - 506 = 1$

$AB^{-1} = \frac{1}{1}\begin{vmatrix} 39 & -23 \\ -22 & 13 \end{vmatrix}$

8- a) $a_{11} = 2 \therefore C_{11} = (-1)^{1+1} \cdot \det(M_{11}) = 1 \det(1) = 1$ $C = \begin{vmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{vmatrix}$

$a_{12} = -2 \therefore C_{12} = (-1)^{1+2} \cdot \det(M_{12}) = -1 \cdot \det(3) = -3$

$a_{21} = 3 \therefore C_{21} = (-1)^{2+1} \cdot \det(M_{21}) = -1 \cdot \det(-2) = 2$ $\begin{vmatrix} 1 & -3 \\ 2 & 2 \end{vmatrix}$

$a_{22} = 1 \therefore C_{22} = (-1)^{2+2} \cdot \det(M_{22}) = 1 \cdot \det(2) = 2$

b) $b_{11} = 2 \therefore C_{11} = (-1)^{1+1} \cdot \det(M_{11}) = 1 \cdot \begin{vmatrix} 2 & 1 \\ 1 & -1 \end{vmatrix} = 1 \cdot (2 \cdot (-1) - 1 \cdot 1) = -3$

$b_{12} = -2 \therefore C_{12} = (-1)^{1+2} \cdot \det(M_{12}) = -1 \cdot \begin{vmatrix} 1 & 1 \\ 0 & -1 \end{vmatrix} = 1 \cdot (1 \cdot (-1) - 1 \cdot 0) = 1$

$b_{13} = 0 \therefore C_{13} = (-1)^{1+3} \cdot \det(M_{13}) = 1 \cdot \begin{vmatrix} 1 & 2 \\ 0 & 1 \end{vmatrix} = 1 \cdot (1 \cdot 1 - 2 \cdot 0) = 1$

$b_{21} = 1 \therefore C_{21} (-1)^{2+1} \cdot \det(M_{21}) = -1 \cdot \begin{vmatrix} -2 & 0 \\ 1 & -1 \end{vmatrix} = 1 \cdot ((-2) \cdot (-1) - 0 \cdot 1) = -2$

$b_{22} = 2 \therefore C_{22} (-1)^{2+2} \cdot \det(M_{22}) = 1 \cdot \begin{vmatrix} 2 & 0 \\ 0 & -1 \end{vmatrix} = 1 \cdot (2 \cdot (-1) - 0 \cdot 1) = -2$

$b_{23} = 1 \therefore C_{23} (1)^{2+3} \cdot \det(M_{23}) = -1 \begin{vmatrix} 2 & -2 \\ 0 & 1 \end{vmatrix} = -1 \cdot (2 \cdot 1 - (-2) \cdot 0) = -2$

$b_{31} = 0 \therefore C_{31} (-1)^{3+1} \cdot \det(M_{31}) = 1 \begin{vmatrix} -2 & 0 \\ 2 & 1 \end{vmatrix} = 1 \cdot ((-2) \cdot 1 - 0 \cdot 2) = -2$

$b_{32} = 1 \therefore C_{32} (1)^{3+2} \cdot \det(M_{32}) = -1 \begin{vmatrix} 2 & 0 \\ 1 & 1 \end{vmatrix} = -1 \cdot (2 \cdot 1 - 0 \cdot 1) = -2$

Jandaia

$b_{33} = -1 \therefore C_{33} = (-1)^{3+3} \cdot \det(M_{33}) = 1 \begin{vmatrix} 2 & -2 \\ 1 & 2 \end{vmatrix} = 1 \cdot (2 \cdot 2 - (-2) \cdot$