QUE ES UNA DETERMINANTE

Es un número que se asocia a una matriz cuadrada y que tiene mucho uso, pues permite simplificar operaciones matriciales, como el cálculo del rango o de la matriz inversa.

det (A) = [A]

$[A] = \begin{bmatrix} 5 & -3 \\ 6 & 4 \end{bmatrix} 2X2 \quad [\,A\,] = \;+(5*4)-(6*-3) \qquad [\,A\,] = +(20)-(-18) = 20+18 =$
$[A] = 38$

$[B] = \begin{bmatrix} -8 & 0 \\ 4 & -2 \end{bmatrix} 2X2 \quad [\,B\,] = +(-8*-2)-(4*0) \quad [\,B\,] = +(16)-(0) = 16-0 =$
$[B] = 16$

$[C] = \begin{bmatrix} 7 & -1 \\ 8 & 12 \end{bmatrix} 2X2 \quad [\,C\,] = +(7*12)-(8*-1) \quad [\,B\,] = +(84)-(-8) = 84+8 = 92$

$[D] = \begin{bmatrix} -4 & -2 \\ -7 & 5 \end{bmatrix} 2X2 \quad [\,D\,] = +(-4*5)-(-78*-2) \quad [\,D\,] = +(-20)-(14)$
$= -20-14 = -34$

$[E] = \begin{bmatrix} 1/2 & -2 \\ 3/4 & 4 \end{bmatrix} 2X2 \quad [\,E\,] = +(1/2*4)-\left(\frac{3}{4}*-2\right) \quad [\,E\,] = +(2)-(-3/2) = 2+3/2$
$= 7/2$

REGLA DE SARRUS:

Solamente sirve para matrices con dimensiones de 3x3

$$[A] = \begin{bmatrix} -2 & 4 & 5 \\ 6 & 7 & -3 \\ 3 & 0 & 2 \end{bmatrix} 3X3$$

$$A = \begin{bmatrix} -2 & 4 & 5 \\ 6 & 7 & -3 \\ 3 & 0 & 2 \\ \mathbf{-2} & \mathbf{4} & \mathbf{5} \\ \mathbf{6} & \mathbf{7} & \mathbf{2} \end{bmatrix} \qquad\qquad A = \begin{bmatrix} -2 & 4 & 5 \\ 6 & 7 & -3 \\ 3 & 0 & 2 \end{bmatrix} \begin{matrix} \mathbf{-2} & \mathbf{4} \\ \mathbf{6} & \mathbf{7} \\ \mathbf{3} & \mathbf{0} \end{matrix}$$

$$A = \begin{bmatrix} -2 & 4 & 5 \\ 6 & 7 & -3 \\ 3 & 0 & 2 \\ \mathbf{-2} & \mathbf{4} & \mathbf{5} \\ \mathbf{6} & \mathbf{7} & \mathbf{-3} \end{bmatrix}$$

$[A] = +\{(-2 * 7 * 2) + (6 * 0 * 5) + (3 * 4 * -3)\} - \{(3 * 7 * 5) + (-2 * 0 * -3) + (6 * 4 * 2)\}$

$[A] = +\{(-28) + (0) + (-36)\} - \{(105) + (0) + (48)\} = +(-64) - (153) = -64 - 153 =$

$[A] = -217$

$$[B] = \begin{bmatrix} 5 & 2 & -3 \\ 0 & 8 & -1 \\ -4 & 5 & 2 \end{bmatrix} 3X3$$

$$B = \begin{bmatrix} 5 & 2 & -3 \\ 0 & 8 & -1 \\ -4 & 5 & 2 \\ \mathbf{5} & \mathbf{2} & \mathbf{-3} \\ \mathbf{0} & \mathbf{8} & \mathbf{-1} \end{bmatrix}$$

$[B] = +\{(5 * 8 * 2) + (0 * 5 * -3) + (-4 * 2 * -1)\}$
$- \{(-4 * 8 * -3) + (5 * 5 * -1) + (0 * 2 * 2)\}$

$[B] = +\{(80) + (0) + (8)\} - \{(96) + (-25) + (0)\} = +(88) - (71) = 88 - 71 = 17$

$[B] = 17$

DETERMINANTE POR COFACTORES

$$[A]=\begin{bmatrix}1&4&0&0\\2&3&0&1\\0&4&1&5\\0&0&2&3\end{bmatrix}4X4$$

Se trabaja con la columna 1

$$[A]=\begin{bmatrix}a_{1,1}&a_{1,2}&a_{1,3}&a_{1,4}\\a_{2,1}&a_{2,2}&a_{2,3}&a_{2,4}\\a_{3,1}&a_{3,2}&a_{3,3}&a_{3,4}\\a_{4,1}&a_{4,2}&a_{4,3}&a_{4,4}\end{bmatrix}4X4 \qquad [A]=\begin{bmatrix}+&-&+&-\\-&+&-&+\\+&-&+&-\\-&+&-&+\end{bmatrix}4X4$$

$$[A]=+1\begin{bmatrix}3&0&1\\4&1&5\\0&2&3\end{bmatrix}3X3\quad -\;2\begin{bmatrix}4&0&0\\4&1&5\\0&2&3\end{bmatrix}3X3\quad +\;0\begin{bmatrix}4&0&0\\3&0&1\\0&2&3\end{bmatrix}3X3\quad -\;0\begin{bmatrix}4&0&0\\3&0&1\\4&1&5\end{bmatrix}3X3$$

$$[A]=+1\begin{bmatrix}3&0&1\\4&1&5\\0&2&3\end{bmatrix}\qquad +3\begin{bmatrix}1&5\\2&3\end{bmatrix}-0\begin{bmatrix}4&5\\0&3\end{bmatrix}+1\begin{bmatrix}4&1\\0&2\end{bmatrix}$$

$$[A]=+3\begin{bmatrix}1&5\\2&3\end{bmatrix}\qquad +[3]+(1*3)-(2*5)=+[3](+3-10)=\;+[3](-7)=-21$$

$$[A]=+1\begin{bmatrix}4&1\\0&2\end{bmatrix}\qquad +[1]+(4*2)-(0*1)=+[1](+8-0)=\;+[1](+8)=8$$

$$[A]=+[1](-21+8)=+[1](-13)=-13$$

$$[A]=-2\begin{bmatrix}4&0&0\\4&1&5\\0&2&3\end{bmatrix}\qquad +4\begin{bmatrix}1&5\\2&3\end{bmatrix}-0\begin{bmatrix}4&5\\0&3\end{bmatrix}+0\begin{bmatrix}4&1\\0&2\end{bmatrix}$$

$$[A]=+4\begin{bmatrix}1&5\\2&3\end{bmatrix}\qquad +[4]+(1*3)-(2*5)=+[4](+3-10)=\;+[4](-7)=-28$$

$$[A]=-[2](-28)=56$$

$$[A]=\begin{bmatrix}1&4&0&0\\2&3&0&1\\0&4&1&5\\0&0&2&3\end{bmatrix}=-13+56=43$$

PROPIEDADES DE LOS DETERMINANTES

Forma triangular. - Producto de su diagonal principal, ya que tienes ceros por debajo o por encima de su diagonal principal

$$[A] = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 2 & 1 & 0 \\ 0 & 0 & 3 & 2 \\ 0 & 0 & 0 & 5 \end{bmatrix} 4x4 = (1 * 2 * 3 * 5) = 30$$

$$[A] = \begin{bmatrix} 5 & 0 & 0 & 0 \\ 2 & 3 & 0 & 0 \\ 0 & 2 & 1 & 0 \\ 1 & 2 & 3 & 4 \end{bmatrix} 4x4 = (5 * 3 * 1 * 4) = 60$$

Forma idéntica. – resultado cero, ya que cuenta con 2 columnas o 2 filas idénticas

$$[A] = \begin{bmatrix} 1 & 1 & 0 & 5 \\ 2 & 0 & 2 & 2 \\ 2 & 0 & 2 & 2 \\ 1 & 5 & 0 & 6 \end{bmatrix} 4x4 = 0$$

$$[A] = \begin{bmatrix} 1 & 1 & 1 & 5 \\ 2 & 0 & 0 & 3 \\ 2 & 0 & 0 & 2 \\ 1 & 5 & 5 & 6 \end{bmatrix} 4x4 = 0$$

Forma ceros. – resultado cero, ya que cuenta con una columna o una fila donde todos sus elementos son cero

$$[A] = \begin{bmatrix} 9 & 5 & 0 & 1 \\ 8 & 4 & 0 & 2 \\ 7 & 3 & 0 & 3 \\ 6 & 2 & 0 & 4 \end{bmatrix} 4x4 = 0$$

$$[A] = \begin{bmatrix} 9 & 8 & 7 & 6 \\ 5 & 4 & 3 & 2 \\ 0 & 0 & 0 & 0 \\ 1 & 2 & 3 & 4 \end{bmatrix} 4x4 = 0$$

DETERMINANTE POR REGLA LAPLACE

Dada una matriz cuadrada [A] de tamaño (n), se define su determinante como la suma, de los productos, de los elementos de una línea cualquiera por sus adjuntos correspondientes

$$[A] = \begin{bmatrix} 2 & 1 & 0 & -1 \\ 0 & -1 & 0 & 3 \\ -2 & 1 & 3 & -2 \\ 3 & 2 & 0 & 1 \end{bmatrix} 4X4$$

Se trabaja con la columna 3

$$[A] = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} \\ a_{2,1} & a_{2,2} & a_{2,3} & a_{2,4} \\ a_{3,1} & a_{3,2} & a_{3,3} & a_{3,4} \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} 4X4 \qquad [A] = \begin{bmatrix} + & - & + & - \\ - & + & - & + \\ + & - & + & - \\ - & + & - & + \end{bmatrix} 4X4$$

$$[A] = \begin{bmatrix} 2 & 1 & 0 & -1 \\ 0 & -1 & 0 & 3 \\ -2 & 1 & 3 & -2 \\ 3 & 2 & 0 & 1 \end{bmatrix} = a_{1,3} * adj_{1,3} + a_{2,3} * adj_{2,3} + a_{3,3} * adj_{3,3} + a_{4,3} * adj_{4,3}$$

$$[A] = \begin{bmatrix} 2 & 1 & 0 & -1 \\ 0 & -1 & 0 & 3 \\ -2 & 1 & 3 & -2 \\ 3 & 2 & 0 & 1 \end{bmatrix} = 0 * adj_{1,3} + 0 * adj_{2,3} + 3 * adj_{3,3} + 0 * adj_{4,3}$$

$$[A] = +(3) \begin{bmatrix} 2 & 1 & -1 \\ 0 & -1 & 3 \\ 3 & 2 & 1 \end{bmatrix} 3X3$$

$$A = \begin{bmatrix} 2 & 1 & -1 \\ 0 & -1 & 3 \\ 3 & 2 & 1 \\ \mathbf{2} & \mathbf{1} & \mathbf{-1} \\ \mathbf{0} & \mathbf{-1} & \mathbf{3} \end{bmatrix}$$

$$[A] = +\{(2 * -1 * 1) + (0 * 2 * -1) + (3 * 1 * 3)\} - \{(3 * -1 * -1) + (2 * 2 * 3) + (0 * 1 * 1)\}$$

$$[A] = +\{(-2) + (0) + (9)\} - \{(3) + (12) + (0)\} = +(7) - (15) = 7 - 15 = -8$$

$$[A] = -8$$

$$[A] = a_{3,3} * adj_{3,3} = +[3] * -8 = -24$$

DETERMINANTE POR REGLA LAPLACE

$$[A] = \begin{bmatrix} 6 & 3 & -2 & 4 \\ 2 & 0 & 0 & 0 \\ 1 & 5 & 2 & 2 \\ -1 & 1 & 3 & -1 \end{bmatrix} 4X4$$

Se trabaja con la columna 3

$$[A] = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} \\ a_{2,1} & a_{2,2} & a_{2,3} & a_{2,4} \\ a_{3,1} & a_{3,2} & a_{3,3} & a_{3,4} \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} 4X4 \qquad [A] = \begin{bmatrix} + & - & + & - \\ - & + & - & + \\ + & - & + & - \\ - & + & - & + \end{bmatrix} 4X4$$

$$[A] = \begin{bmatrix} 6 & 3 & -2 & 4 \\ 2 & 0 & 0 & 0 \\ 1 & 5 & 2 & 2 \\ -1 & 1 & 3 & -1 \end{bmatrix} = a_{2,1} * adj_{2,1} + a_{2,2} * adj_{2,2} + a_{2,3} * adj_{2,3} + a_{2,4} * adj_{2,4}$$

$$[A] = \begin{bmatrix} 6 & 3 & -2 & 4 \\ 2 & 0 & 0 & 0 \\ 1 & 5 & 2 & 2 \\ -1 & 1 & 3 & -1 \end{bmatrix} = -(2) * adj_{2,1} + 0 * adj_{2,2} + 0 * adj_{2,3} + 0 * adj_{2,4}$$

$$[A] = -(2) \begin{bmatrix} 3 & -2 & 4 \\ 5 & 2 & 2 \\ 1 & 3 & -1 \end{bmatrix} 3X3$$

$$A = \begin{bmatrix} 3 & -2 & 4 \\ 5 & 2 & 2 \\ 1 & 3 & -1 \\ \mathbf{3} & \mathbf{-2} & \mathbf{4} \\ \mathbf{5} & \mathbf{2} & \mathbf{2} \end{bmatrix}$$

$$[A] = +\{(3 * 2 * -1) + (5 * 3 * 4) + (1 * -2 * 2)\} - \{(1 * 2 * 4) + (3 * 3 * 2) + (5 * -2 * -1)\}$$

$$[A] = +\{(-6) + (60) + (-4)\} - \{(8) + (18) + (10)\} = +(50) - (36) = 50 - 36 = 14$$

$$[A] = 14$$

$$[A] = a_{3,3} * adj_{3,3} = -[2] * 14 = -28$$

DETERMINANTES POR METODO GAUUS

$$[A] = \begin{bmatrix} 1 & -2 & -1 & 3 \\ -1 & 3 & -2 & -2 \\ 2 & 0 & 1 & 1 \\ 1 & -2 & 2 & 3 \end{bmatrix} 4X4 \qquad [A] = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} \\ a_{2,1} & a_{2,2} & a_{2,3} & a_{2,4} \\ a_{3,1} & a_{3,2} & a_{3,3} & a_{3,4} \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} 4X4$$

$$[A] = \begin{bmatrix} 1 & -2 & -1 & 3 \\ -1 & 3 & -2 & -2 \\ 2 & 0 & 1 & 1 \\ 1 & -2 & 2 & 3 \end{bmatrix} \begin{matrix} \\ F2 + F1 \\ F3 - 2F1 \\ F4 - F1 \end{matrix}$$

F2+F1

$$[A] = \begin{bmatrix} 1 & -2 & -1 & 3 \\ 0 & 1 & -3 & 1 \\ 2 & 0 & 1 & 1 \\ 1 & -2 & 2 & 3 \end{bmatrix} a_{2,1}(1 - 1 = 0); a_{2,2}(-2 + 3 = 1); a_{2,3}(-1 - 2 = -3); a_{2,4}(3 - 2 = 1);$$

F3-2F1

$$[A] = \begin{bmatrix} 1 & -2 & -1 & 3 \\ 0 & 1 & -3 & 1 \\ 0 & 4 & 3 & -5 \\ 1 & -2 & 2 & 3 \end{bmatrix} a_{3,1}(2 - 2 = 0); a_{3,2}(0 + 4 = 4); a_{3,3}(1 + 2 = 3); a_{3,4}(1 - 6 = -5);$$

F4-F1

$$[A] = \begin{bmatrix} 1 & -2 & -1 & 3 \\ 0 & 1 & -3 & 1 \\ 0 & 4 & 3 & -5 \\ 0 & 0 & 3 & 0 \end{bmatrix} a_{4,1}(1 - 1 = 0); a_{4,2}(-2 + 2 = 0); a_{4,3}(1 + 2 = 3); a_{4,4}(3 - 3 = 0);$$

F3-4F2

$$[A] = \begin{bmatrix} 1 & -2 & -1 & 3 \\ 0 & 1 & -3 & 1 \\ 0 & 0 & 15 & -9 \\ 0 & 0 & 3 & 0 \end{bmatrix} a_{3,1}(0 - 0 = 0); a_{3,2}(4 - 4 = 0); a_{3,3}(3 + 12 = 15); a_{3,4}(-5 - 4 = -9);$$

C3 cambia C4

$$[A] = \begin{bmatrix} 1 & -2 & 3 & -1 \\ 0 & 1 & 1 & -3 \\ 0 & 0 & -9 & 15 \\ 0 & 0 & 0 & 3 \end{bmatrix}$$

$$[A] = \begin{bmatrix} 1 & -2 & 3 & -1 \\ 0 & 1 & 1 & -3 \\ 0 & 0 & -9 & 15 \\ 0 & 0 & 0 & 3 \end{bmatrix} DIAGONAL\ PRINCIPAL = -(1 * 1 * -9 * 3) = -(-27) = 27$$

DETERMINANTES POR METODO GAUUS

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 2 & 5 & -3 & 3 \\ -1 & 5 & -2 & 3 \\ 2 & 11 & -4 & 4 \end{bmatrix} 4X4 \qquad [A] = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} \\ a_{2,1} & a_{2,2} & a_{2,3} & a_{2,4} \\ a_{3,1} & a_{3,2} & a_{3,3} & a_{3,4} \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} 4X4$$

$$[A] = \begin{array}{c} \begin{bmatrix} 1 & 1 & -1 & 1 \\ 2 & 5 & -3 & 3 \\ -1 & 5 & -2 & 3 \\ 2 & 11 & -4 & 4 \end{bmatrix} \end{array} \begin{array}{c} \\ F2-2F1 \\ F3+F1 \\ F4-2F1 \end{array}$$

F2-2F1

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ -1 & 5 & -2 & 3 \\ 2 & 11 & -4 & 4 \end{bmatrix} a_{2,1}(2-2=0); a_{2,2}(5+2=3); a_{2,3}(-3+2=-1); a_{2,4}(3-2=1);$$

F3+F1

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 6 & -3 & 4 \\ 2 & 11 & -4 & 4 \end{bmatrix} a_{3,1}(-1+1=0); a_{3,2}(5+1=6); a_{3,3}(-2-1=-3); a_{3,4}(3+1=4);$$

F4-2F1

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 6 & -3 & 4 \\ 0 & 9 & -2 & 2 \end{bmatrix} a_{4,1}(2-2=0); a_{4,2}(11-2=9); a_{4,3}(-4+2=-2); a_{4,4}(4-2=0);$$

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 6 & -3 & 4 \\ 0 & 9 & -2 & 2 \end{bmatrix} \begin{array}{c} \\ \\ F3-2F2 \\ F4-3F2 \end{array}$$

F3-2F2

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 0 & -1 & 2 \\ 0 & 9 & -2 & 2 \end{bmatrix} a_{4,1}(0-0=0); a_{4,2}(6-6=0); a_{4,3}(-3+2=-1); a_{4,4}(4-2=2);$$

F4-3F2

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 0 & -1 & 2 \\ 0 & 0 & 1 & -1 \end{bmatrix} a_{4,1}(0-0=0); a_{4,2}(9-9=0); a_{4,3}(-2+3=1); a_{4,4}(2-3=-1);$$

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 0 & -1 & 2 \\ 0 & 0 & 1 & -1 \end{bmatrix} F4 + F3$$

F4+F3

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 0 & -1 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix} a_{3,1}(0 + 0 = 0); a_{3,2}(0 + 0 = 0); a_{3,3}(1 - 1 = 0); a_{3,4}(-1 + 2 = 1);$$

$$[A] = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 0 & 3 & -1 & 1 \\ 0 & 0 & -1 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix} DIAGONAL\ PRINCIPAL = (1 * 3 * -1 * 1) = -3$$

DETERMINANTES POR METODO GAUUS

$$[A] = \begin{bmatrix} 1 & -2 & 1 & 3 \\ -1 & 3 & -2 & -2 \\ 2 & 0 & 1 & 1 \\ 1 & -2 & 2 & 3 \end{bmatrix} 4X4 \qquad [A] = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} \\ a_{2,1} & a_{2,2} & a_{2,3} & a_{2,4} \\ a_{3,1} & a_{3,2} & a_{3,3} & a_{3,4} \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} 4X4$$

$$[A] = \begin{bmatrix} 1 & -2 & 1 & 3 \\ -1 & 3 & -2 & -2 \\ 2 & 0 & 1 & 1 \\ 1 & -2 & 2 & 3 \end{bmatrix} \begin{matrix} F2 + F1 \\ F3 - 2F1 \\ F4 - F1 \end{matrix}$$

F2+F1

$$[A] = \begin{bmatrix} 1 & -2 & 1 & 3 \\ 0 & 1 & -1 & 1 \\ 2 & 0 & 1 & 1 \\ 1 & -2 & 2 & 3 \end{bmatrix} a_{2,1}(1 - 1 = 0); a_{2,2}(-2 + 3 = 1); a_{2,3}(1 - 2 = -1); a_{2,4}(3 - 2 = 1);$$

F3-2F1

$$[A] = \begin{bmatrix} 1 & -2 & 1 & 3 \\ 0 & 1 & -1 & 1 \\ 0 & 4 & -1 & -5 \\ 1 & -2 & 2 & 3 \end{bmatrix} a_{3,1}(2 - 2 = 0); a_{3,2}(0 + 4 = 4); a_{3,3}(1 - 2 = -1); a_{3,4}(1 - 6 = -5);$$

F4-F1

$$[A] = \begin{bmatrix} 1 & -2 & 1 & 3 \\ 0 & 1 & -1 & 1 \\ 0 & 4 & -1 & -5 \\ 0 & 0 & 1 & 0 \end{bmatrix} a_{4,1}(1 - 1 = 0); a_{4,2}(-2 + 2 = 0); a_{4,3}(-1 + 2 = 1); a_{4,4}(3 - 3 = 0);$$

F3-4F2

$$[A] = \begin{bmatrix} 1 & -2 & 1 & 3 \\ 0 & 1 & -1 & 1 \\ 0 & 0 & 3 & -9 \\ 0 & 0 & 1 & 0 \end{bmatrix} a_{3,1}(0 - 0 = 0); a_{3,2}(4 - 4 = 0); a_{3,3}(-1 + 4 = 3); a_{3,4}(-5 - 4 = -9);$$

C3 cambia C4

$$[A] = \begin{bmatrix} 1 & -2 & 3 & 1 \\ 0 & 1 & 1 & -1 \\ 0 & 0 & -9 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$[A] = \begin{bmatrix} 1 & -2 & 3 & -1 \\ 0 & 1 & 1 & -3 \\ 0 & 0 & -9 & 15 \\ 0 & 0 & 0 & 3 \end{bmatrix} DIAGONAL\ PRINCIPAL = -(1 * 1 * -9 * 1) = -(-9) = 9$$

REGLA DE CHIA:

Consiste en convertir cualquier fila o cualquier columna en una fila o columna que tenga 3 ceros, Adaptación de la regla de LAPLACES, al seleccionar una fila o columna para resolver atra vez de los cofactores

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & -1 \\ 1 & 1 & 0 & 1 \end{bmatrix} 4X4 \qquad [A] = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} \\ a_{2,1} & a_{2,2} & a_{2,3} & a_{2,4} \\ a_{3,1} & a_{3,2} & a_{3,3} & a_{3,4} \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} 4X4$$

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & -1 \\ 1 & 1 & 0 & 1 \end{bmatrix} \begin{matrix} F2 - 4F4 \\ F3 + F4 \end{matrix}$$

F2-4F4

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ -3 & -2 & 3 & 0 \\ 2 & 1 & 3 & -1 \\ 1 & 1 & 0 & 1 \end{bmatrix} a_{2,1}(1 - 4 = -3); a_{2,2}(2 - 4 = -2); a_{2,3}(3 - 0 = 3); a_{2,4}(4 - 4 = 0);$$

F3+F4

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ -3 & -2 & 3 & 0 \\ 3 & 2 & 3 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix} a_{3,1}(2 + 1 = 3); a_{3,2}(1 + 1 = 2); a_{3,3}(3 - 0 = 3); a_{3,4}(-1 + 1 = 0);$$

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ -3 & -2 & 3 & 0 \\ 3 & 2 & 3 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix} \ REGLA\ DE\ LAPLACE$$

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ -3 & -2 & 3 & 0 \\ 3 & 2 & 3 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix} = a_{1,4} * adj_{1,4} + a_{2,4} * adj_{2,4} + a_{3,4} * adj_{3,4} + a_{4,4} * adj_{4,4}$$

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ -3 & -2 & 3 & 0 \\ 3 & 2 & 3 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix} = 0 * adj_{1,4} + 0 * adj_{2,4} + 0 * adj_{3,4} + (1) * adj_{4,4}$$

$$[A] = +(1)\begin{bmatrix} 3 & 1 & 3 \\ -3 & -2 & 3 \\ 3 & 2 & 3 \end{bmatrix} 3X3$$

$$A = \begin{bmatrix} 3 & 1 & 3 \\ -3 & -2 & 3 \\ 3 & 2 & 3 \\ \mathbf{3} & \mathbf{1} & \mathbf{3} \\ -\mathbf{3} & -\mathbf{2} & \mathbf{3} \end{bmatrix} REGLA\ DE\ SARUS$$

$$[A] = +\{(3*-2*3) + (-3*2*3) + (3*1*3)\} - \{(3*-2*3) + (3*2*3) + (-3*1*3)\}$$

$$[A] = +\{(-18) + (-18) + (9)\} - \{(-18) + (18) + (-9)\} = +(-27) - (-9) = -27 + 9 = -18$$

$$[A] = -18$$

$$[A] = a_{3,3} * adj_{3,3} = +[1] * -18 = -18$$

REGLA DE CHIA:

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & -1 \\ 1 & 1 & 0 & 1 \end{bmatrix} 4X4 \qquad [A] = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} \\ a_{2,1} & a_{2,2} & a_{2,3} & a_{2,4} \\ a_{3,1} & a_{3,2} & a_{3,3} & a_{3,4} \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} 4X4$$

$$[A] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & -1 \\ 1 & 1 & 0 & 1 \end{bmatrix} \begin{matrix} C2 - C1 \\ C4 - C1 \end{matrix}$$

C2-C1

$$[A] = \begin{bmatrix} 3 & -2 & 3 & 0 \\ 1 & 1 & 3 & 4 \\ 2 & -1 & 3 & -1 \\ 1 & 0 & 0 & 1 \end{bmatrix} a_{1,2}(1-3=-2); a_{2,2}(2-1=1); a_{3,2}(1-2=-1); a_{4,2}(1-1=0);$$

C4-C1

$$[A] = \begin{bmatrix} 3 & -2 & 3 & -3 \\ 1 & 1 & 3 & 3 \\ 2 & -1 & 3 & -3 \\ 1 & 0 & 0 & 0 \end{bmatrix} a_{1,4}(0-3=-3); a_{2,4}(4-1=3); a_{3,4}(-1-2=-3); a_{4,4}(1-1=0);$$

$$[A] = \begin{bmatrix} 3 & -2 & 3 & -3 \\ 1 & 1 & 3 & 3 \\ 2 & -1 & 3 & -3 \\ 1 & 0 & 0 & 0 \end{bmatrix} \; REGLA\ DE\ LAPLACE$$

$$[A] = \begin{bmatrix} 3 & -2 & 3 & -3 \\ 1 & 1 & 3 & 3 \\ 2 & -1 & 3 & -3 \\ 1 & 0 & 0 & 0 \end{bmatrix} = a_{4,1} * adj_{4,1} + a_{4,2} * adj_{4,2} + a_{4,3} * adj_{4,3} + a_{4,4} * adj_{4,4}$$

$$[A] = \begin{bmatrix} 3 & -2 & 3 & -3 \\ 1 & 1 & 3 & 3 \\ 2 & -1 & 3 & -3 \\ 1 & 0 & 0 & 0 \end{bmatrix} = -(1) * adj_{4,1} + 0 * adj_{4,2} + 0 * adj_{4,3} + 0 * adj_{4,4}$$

$$[A] = -(1)\begin{bmatrix} -2 & 3 & -3 \\ 1 & 3 & 3 \\ -1 & 3 & -3 \end{bmatrix} 3X3$$

$$A = \begin{bmatrix} -2 & 3 & -3 \\ 1 & 3 & 3 \\ -1 & 3 & -3 \\ \mathbf{-2} & \mathbf{3} & \mathbf{-3} \\ \mathbf{1} & \mathbf{3} & \mathbf{3} \end{bmatrix} REGLA\ DE\ SARUS$$

$$[A] = +\{(-2 * 3 * -3) + (1 * 3 * -3) + (-1 * 3 * 3)\} \\ - \{(-1 * 3 * -3) + (-2 * 3 * 3) + (1 * 3 * -3)\}$$

$$[A] = +\{(18) + (-9) + (-9)\} - \{(9) + (-18) + (-9)\} = +(0) - (-18) = 0 + 18 = 18$$

$$[A] = -18$$

$$[A] = a_{3,3} * adj_{3,3} = -[1] * 18 = -18$$

Problemas para resolver de forma individual y transcribir en el cuaderno, JUNTO CON EL TEMARIO

DETERMINATE SARUS

$$[A] = \begin{bmatrix} 3 & -2 & 4 \\ 2 & 3 & 4 \\ 4 & 0 & 5 \end{bmatrix} 3X3$$

$$[B] = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 2 & 4 \\ -2 & 4 & 5 \end{bmatrix} 3X3$$

DETERMIANTE COFACTORES

$$[A] = \begin{bmatrix} 1 & 3 & 5 & 2 \\ 0 & -1 & 3 & 4 \\ 2 & 1 & 9 & 6 \\ 3 & 2 & 4 & 8 \end{bmatrix} 4X4$$

$$[B] = \begin{bmatrix} 1 & 4 & 0 & 0 \\ 2 & 3 & 0 & 1 \\ 0 & 4 & 1 & 5 \\ 0 & 0 & 2 & 3 \end{bmatrix} 4X4$$

DETERMIANTE LAPLACE

$$[A] = \begin{bmatrix} 5 & -2 & 4 \\ 6 & 7 & -3 \\ 3 & 0 & 2 \end{bmatrix} 3X3$$

$$[B] = \begin{bmatrix} 10 & -2 & 0 \\ 5 & -4 & 7 \\ 3 & 1 & -1 \end{bmatrix} 3X3$$

DETERMIANTE GAUSS

$$[A] = \begin{bmatrix} 2 & 0 & 2 & 4 \\ 3 & 3 & 1 & 2 \\ 0 & 1 & 3 & 1 \\ 4 & 1 & 7 & 1 \end{bmatrix} 4X4$$

$$[B] = \begin{bmatrix} 3 & 1 & 3 & 0 \\ 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & -1 \\ 1 & 1 & 0 & 1 \end{bmatrix} 4X4$$

DETERMIANTE CHIO

$$[A] = \begin{bmatrix} 2 & 0 & 2 & 4 \\ 3 & 3 & 1 & 2 \\ 0 & 1 & 2 & 1 \\ 4 & 1 & 7 & 1 \end{bmatrix} 4X4$$

$$[B] = \begin{bmatrix} 1 & 4 & 0 & 0 \\ 2 & 1 & 5 & 1 \\ 9 & 2 & 1 & 0 \\ 8 & 3 & 1 & 2 \end{bmatrix} 4X4$$