

# MATEMÀTIQUES II

Lliurament 1

## Menors i adjunts

$$\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & \textcircled{a}_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$$

Josep Mulet Pol

- Partim d'una matriu quadrada  $A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$
- Triam un element, per exemple,  $a_{23}$

- Eliminam la fila 2 i columna 3  $A = \begin{pmatrix} 3 & 5 & -2 \\ \cancel{-1} & \cancel{4} & \cancel{1} \\ 5 & -2 & 6 \end{pmatrix}$
- El menor  $\alpha_{23}$  és el determinant de la matriu que queda

$$\alpha_{23} = \begin{vmatrix} 3 & 5 \\ 5 & -2 \end{vmatrix} \stackrel{= 3 \cdot (-2) - 5 \cdot 5}{=} -6 - 25 = -31$$

- Menor  $\alpha_{22}$  de

$$A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$$

- Triam un element,  $a_{22}$

- Eliminam la fila 2 i columna 2

$$A = \begin{pmatrix} 3 & 5 & -2 \\ \cancel{-1} & \cancel{4} & 1 \\ 5 & -2 & 6 \end{pmatrix}$$

- El menor  $\alpha_{22}$  és el determinant de la matriu que queda

$$\alpha_{22} = \begin{vmatrix} 3 & -2 \\ 5 & 6 \end{vmatrix} = 3 \cdot 6 - (-2) \cdot 5 = 18 + 10 = 28$$

Donada una matriu quadrada  $A$ ,

Es defineix l'adjunt de l'element  $a_{ij}$ , com

$$\mathbf{A}_{ij} = \text{signe} \cdot \alpha_{ij}$$

$$\text{signe} = \begin{cases} + & \text{si } i+j \text{ és parell} \\ - & \text{si } i+j \text{ és imparell} \end{cases}$$

$$\begin{bmatrix} + & - \\ - & + \end{bmatrix}$$

$$\begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

$$\begin{bmatrix} + & - & + & - \\ - & + & - & + \\ + & - & + & - \\ - & + & - & + \end{bmatrix}$$

...

- Calcula els adjunts  $\mathbf{A}_{22}$  i  $\mathbf{A}_{23}$  de  $A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$

$$\mathbf{A}_{ij} = \text{signe} \cdot \alpha_{ij}$$

$$\begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$$

$$\begin{bmatrix} + & - & + \\ - & \textcircled{+} & - \\ + & - & + \end{bmatrix}$$

$$\begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$$

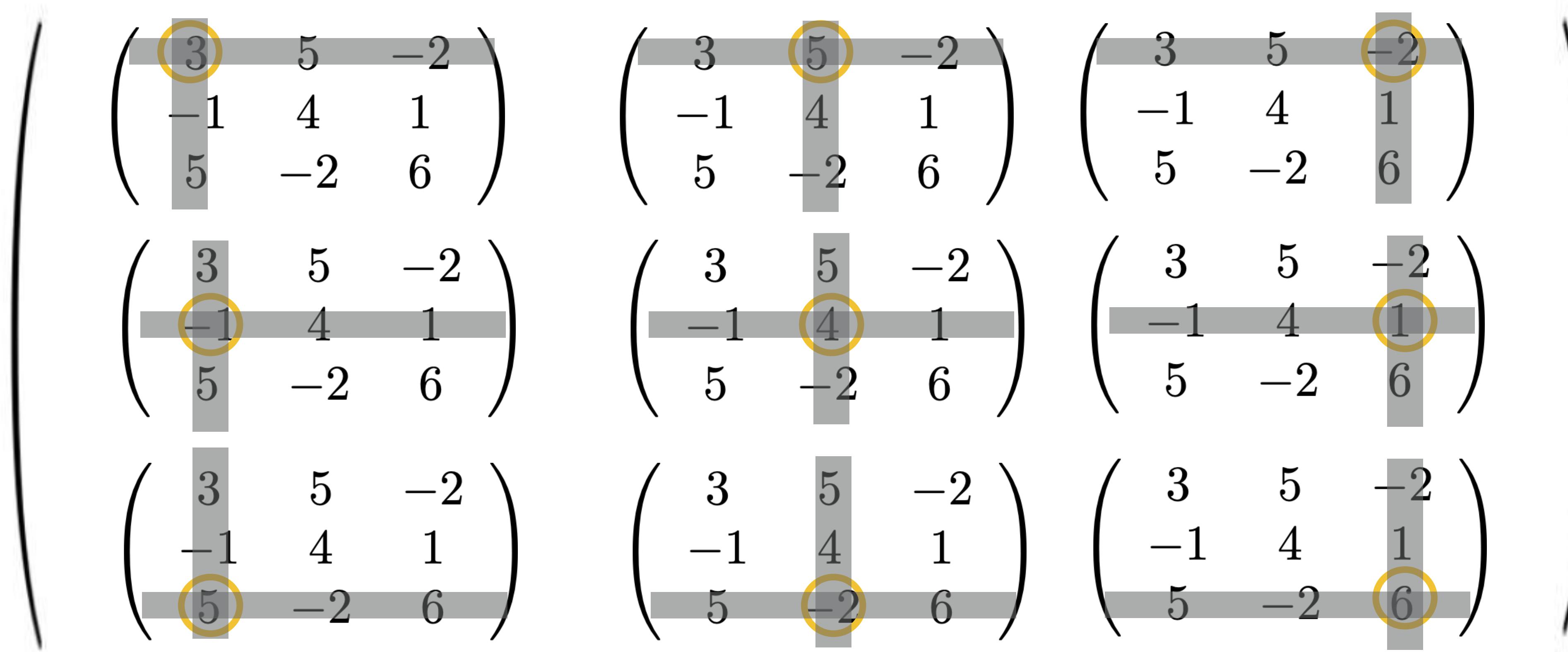
$$\begin{bmatrix} + & - & + \\ - & + & \textcircled{-} \\ + & - & + \end{bmatrix}$$

$$\begin{aligned} \mathbf{A}_{22} &= +\alpha_{22} = + \begin{vmatrix} 3 & -2 \\ 5 & 6 \end{vmatrix} = \\ &= 3 \cdot 6 - (-2) \cdot 5 = 26 \end{aligned}$$

$$\begin{aligned} \mathbf{A}_{23} &= -\alpha_{23} = - \begin{vmatrix} 3 & 5 \\ 5 & -2 \end{vmatrix} = \\ &= - (3 \cdot (-2) - 5 \cdot 5) = +31 \end{aligned}$$

- Calcula la **matriu d'ajunts** de

$$A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$$



- Calcula la **matriu d'ajunts** de  $A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$

$$\left( \begin{array}{ccc} \begin{vmatrix} 4 & 1 \\ -2 & 6 \end{vmatrix} & \begin{vmatrix} -1 & 1 \\ 5 & 6 \end{vmatrix} & \begin{vmatrix} -1 & 4 \\ 5 & -2 \end{vmatrix} \\ \begin{vmatrix} 5 & -2 \\ -2 & 6 \end{vmatrix} & \begin{vmatrix} 3 & -2 \\ 5 & 6 \end{vmatrix} & \begin{vmatrix} 3 & 5 \\ 5 & -2 \end{vmatrix} \\ \begin{vmatrix} 5 & -2 \\ 4 & 1 \end{vmatrix} & \begin{vmatrix} 3 & -2 \\ -1 & 1 \end{vmatrix} & \begin{vmatrix} 3 & 5 \\ -1 & 4 \end{vmatrix} \end{array} \right)$$

- Calcula la **matriu d'ajunts** de  $A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$

$$\left( \begin{array}{ccc|c} \left| \begin{array}{cc|c} 4 & 1 \\ -2 & 6 \\ \hline 26 & 6 \end{array} \right| & \left| \begin{array}{cc|c} -1 & 1 \\ 5 & 6 \\ \hline 11 & 6 \end{array} \right| & \left| \begin{array}{cc|c} -1 & 4 \\ 5 & -2 \\ \hline 18 & -2 \end{array} \right| \\ \left| \begin{array}{ccc} 5 & -2 \\ -2 & 6 \\ \hline 26 & 6 \end{array} \right| & \left| \begin{array}{ccc} 3 & -2 \\ 5 & 6 \\ \hline 28 & 6 \end{array} \right| & \left| \begin{array}{ccc} 3 & 5 \\ 5 & -2 \\ \hline -31 & 2 \end{array} \right| \\ \left| \begin{array}{cc|c} 5 & -2 \\ 4 & 1 \\ \hline 13 & 1 \end{array} \right| & \left| \begin{array}{cc|c} 3 & -2 \\ -1 & 1 \\ \hline 1 & 1 \end{array} \right| & \left| \begin{array}{cc|c} 3 & 5 \\ -1 & 4 \\ \hline 17 & 6 \end{array} \right| \end{array} \right)$$

- Calcula la **matriu d'ajunts** de

$$A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$$

26

-11

-18

26

28

-31

13

1

17

- Calcula la **matriu d'ajunts** de  $A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$

$$\begin{vmatrix} 26 & -11 & -18 \\ 26 & 28 & -31 \\ 13 & 1 & 17 \end{vmatrix}$$

$$\begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

- Calcula la **matriu d'ajunts** de  $A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$

$$\begin{vmatrix} 26 & +11 & -18 \\ -26 & 28 & +31 \\ 13 & -1 & 17 \end{vmatrix}$$

$$\begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

- Calcula la **matriu d'ajunts** de  $A = \begin{pmatrix} 3 & 5 & -2 \\ -1 & 4 & 1 \\ 5 & -2 & 6 \end{pmatrix}$

$$\text{adj } (A) = \begin{pmatrix} 26 & 11 & -18 \\ -26 & 28 & 31 \\ 13 & -1 & 17 \end{pmatrix}$$



<https://iedib.net>

---

Josep Mulet Pol  
(2019)

---

