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Seminar 3

$$\begin{cases} x - y + 2z = 7 \\ 3y + z = 7 \\ 2x - y + 3z = 15 \end{cases}$$

Folosind metoda lui Gauss și să se calculeze A^{-1}

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 7 \\ 0 & 3 & 1 & 7 \\ 2 & -1 & 3 & 15 \end{array}\right] \to \left[\begin{array}{ccc|c} 1 & -1 & 2 & 7 \\ 0 & 3 & 1 & 7 \\ 0 & 1 & -1 & 1 \end{array}\right] \to \left[\begin{array}{ccc|c} 3 & 0 & 7 & 28 \\ 0 & 3 & 1 & 7 \\ 0 & 0 & -4 & -4 \end{array}\right] \to$$

$$\to \begin{array}{c} \left[\begin{array}{ccc|c} 3 & 0 & 0 & 21 \\ 0 & 3 & 0 & 6 \\ 0 & 0 & 1 & 1 \end{array}\right] \\ \begin{array}{ccc} x & y & z \end{array} \end{array} \to \begin{array}{l} 3x = 21 \\ 3y = 6 \\ z = 1 \end{array} \quad \begin{array}{l} x = 7 \\ \to y = 2 \\ z = 1 \end{array}$$

$$\left[\begin{array}{ccc|ccc} 1 & -1 & 2 & 1 & 0 & 0 \\ 0 & 3 & 1 & 0 & 1 & 0 \\ 2 & -1 & 3 & 0 & 0 & 1 \end{array}\right] \to \left[\begin{array}{ccc|ccc} 1 & -1 & 2 & 1 & 0 & 0 \\ 0 & 3 & 1 & 0 & 1 & 0 \\ 0 & 1 & -1 & 2 & 0 & 1 \end{array}\right]$$

$$\to \left[\begin{array}{ccc|ccc} 3 & 0 & 7 & 3 & 1 & 0 \\ 0 & 3 & 1 & 0 & 1 & 0 \\ 0 & 0 & -4 & 6 & -1 & 3 \end{array}\right] \to \left[\begin{array}{ccc|ccc} -12 & 0 & 0 & -54 & +3 & 21 \\ 0 & -12 & 0 & -6 & -3 & -3 \\ 0 & 0 & -4 & 6 & -1 & 3 \end{array}\right]$$

$$\to \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 9/6 & -1/4 & -7/4 \\ 0 & 1 & 0 & 1/2 & 1/4 & 1/4 \\ 0 & 0 & 1 & -3/2 & 1/4 & -3/4 \end{array}\right]$$

$$A = \begin{bmatrix} 2 & 0 & 2 & 0 & 2 \\ 0 & 1 & 0 & 1 & 0 \\ 2 & 1 & 0 & 2 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix} \to \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 2 & 0 \\ 0 & 2 & -4 & 4 & -2 \\ 0 & 2 & 0 & 2 & 0 \end{bmatrix} \to \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & -8 & 4 & 4 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \to$$

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$rang(A) = 3$

Să se determine valorile parametrului $\lambda \in \mathbb{R}$

$$\begin{cases} x + y - z = 0 \\ 3x - 2y + 2z = 5 \\ 2x + 3y + \lambda z = 2 \end{cases}$$

Compatibil unic determinat?

Sistemul este compatibil unic determinat $\Leftrightarrow rang(A) = 3 = rang(\bar{A})$

$$\left[\begin{array}{ccc|c} 1 & 1 & -1 & 0 \\ 3 & -2 & 2 & 5 \\ 2 & 3 & \lambda & 2 \end{array}\right] \to \left[\begin{array}{ccc|c} 1 & 1 & -1 & 0 \\ 0 & -5 & 5 & 5 \\ 0 & 1 & \lambda+2 & 2 \end{array}\right] \to \left[\begin{array}{ccc|c} 1 & 1 & -1 & 0 \\ 0 & 1 & -1 & -1 \\ 0 & 1 & \lambda+2 & 2 \end{array}\right]$$

$$\to \left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & \lambda+3 & 3 \end{array}\right] \to \lambda + 3 \neq 0 \to \lambda \neq -3$$

Fie sistemul de ecuații:

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

Să se calculeze rangul matricei coeficienților săi

Să se determine $\lambda \in \mathbb{R}$ → sistemul să fie compatibil și apoi să se rezolve

$$\begin{bmatrix} 2 & -1 & 1 & 2 \\ 2 & 2 & 4 & 2 \\ 3 & -2 & 1 & 3 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ z \\ t \end{bmatrix} = \begin{bmatrix} 1 \\ \lambda \\ 1 \end{bmatrix}$$

$$A \times X = B$$

$\text{rang}(A) = 2$

$$A = \begin{bmatrix} 2 & -1 & 1 & 2 \\ 2 & 2 & 4 & 2 \\ 3 & -2 & 1 & 3 \end{bmatrix} \to \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 6 & 6 & 0 \\ 0 & -1 & -1 & 0 \end{bmatrix} \to \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \to \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\bar{A} = \left[\begin{array}{cccc|c} 2 & -1 & 1 & 2 & 1 \\ 2 & 2 & 4 & 2 & \lambda \\ 3 & -2 & 1 & 3 & 1 \end{array}\right] \to \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 0 \\ 0 & 6 & 6 & 0 & 2\lambda-2 \\ 0 & -1 & -1 & 0 & -1 \end{array}\right]$$

$$\to \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 2\lambda-8 \end{array}\right]$$

$\text{rang}(\bar{A}) = 2 \to \lambda = 4$

$\text{rang}(\bar{A}) = 3 \to \lambda \neq 4$

Proiect

Metoda lui Gauss (Totală) de rezolvare a sistemelor liniare

Sistem de coeficienți reali: INPUT TERMEN: 05/04
Compatibilitate și rezultatul: OUTPUT