

TD1 : Direct Methods

Exercise 1:

Solve the following equations using the Gaussian method:

$$\begin{array}{ll}
 1) \begin{cases} 8x_2 + 2x_3 = -7 \\ 3x_1 + 5x_2 + 2x_3 = 8 \\ 6x_1 + 2x_2 + 8x_3 = 26 \end{cases} & 2) \begin{cases} x_1 - x_2 + 2x_3 - x_4 = -8 \\ 2x_1 - 2x_2 + 3x_3 - 3x_4 = -20 \\ x_1 + x_2 + x_3 = -2 \\ x_1 - x_2 + 4x_3 + 3x_4 = 4 \end{cases} \\
 3) \begin{cases} x_1 + x_2 + x_3 = 4 \\ 2x_1 + 2x_2 + x_3 = 4 \\ x_1 + x_2 + x_3 = 6 \end{cases} & 4) \begin{cases} x_1 - x_2 + x_3 - x_4 = 2 \\ x_1 - x_2 + x_3 + x_4 = 0 \\ 4x_1 - 4x_2 + 4x_3 = 4 \\ -2x_1 + 2x_2 - 2x_3 + x_4 = -3 \end{cases}
 \end{array}$$

Exercise 2:

Solve the following equations

$$\begin{cases} 2x_1 + x_2 + x_3 = 10 \\ 3x_1 + 2x_2 + 3x_3 = 18 \\ x_1 + 4x_2 + 9x_3 = 16 \end{cases}$$

using: a) Gauss Elimination b) Gauss-Jordan Method c) Gauss Elimination With Partial Pivoting and total pivoting .

Exercise 3:

Solve the following equations

$$\begin{cases} x_1 + 2x_2 + 3x_3 = 5 \\ 2x_1 + 8x_2 + 22x_3 = 6 \\ 3x_1 + 22x_2 + 82x_3 = -10 \end{cases}$$

using: a) Crout Method b) Doolittle's Method c) Cholesky Method

Exercise 4:

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

- Find the determinant matrix of A using the Elimination method .
- Find the inverse matrix of A using the Gauss-Jordan Method methods.
- Solve $AX = b$ where $b = (1,1,1,1)^t$.