Análisis Numérico - Entraga 2

Elig Giovanny Mosquera Mosquera

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1 Introduction

En el presente documento se presentarán las pruebas realizadas a los métodos de la entrega 2, con sus resultados.

2 Métodos

LU con Gaussiana Simple

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Resultados:

Etapa 0

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 1.000000 & 15.500000 & 3.000000 & 8.000000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 14.000000 & 5.000000 & -2.000000 & 30.000000 \end{bmatrix}$$

Etapa 1

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 0.000000 & 8.500000 & -2.000000 & 19.500000 \end{bmatrix}$$

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.250000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 3.500000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \end{bmatrix}$$

Etapa 2

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & -3.752381 & 1.698413 \\ 0.000000 & 0.000000 & -3.619048 & 15.587302 \end{bmatrix}$$

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.250000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & -0.082540 & 1.000000 & 0.000000 \\ 3.500000 & 0.539683 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & -3.752381 & 1.698413 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \end{bmatrix}$$

Etapa 3

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & -3.752381 & 1.698413 \\ 0.000000 & 0.000000 & 0.000000 & 13.949239 \end{bmatrix}$$

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.250000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & -0.082540 & 1.000000 & 0.000000 \\ 3.500000 & 0.539683 & 0.964467 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & -3.752381 & 1.698413 \\ 0.000000 & 0.000000 & 0.000000 & 13.949239 \end{bmatrix}$$

Despues de aplicar sustitución progresiva y regresiva

$$x = \begin{bmatrix} 0.525109 \\ 0.255459 \\ -0.410480 \\ -0.281659 \end{bmatrix}$$

LU con Pivoteo Parcial

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Resultados:

Etapa 0

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 1.000000 & 15.500000 & 3.000000 & 8.000000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 14.000000 & 5.000000 & -2.000000 & 30.000000 \end{bmatrix}$$

Etapa 1

$$\begin{bmatrix} 14.000000 & 5.000000 & -2.000000 & 30.000000 \\ 0.000000 & 15.142857 & 3.142857 & 5.857143 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 0.000000 & -2.428571 & 0.571429 & -5.571429 \end{bmatrix}$$

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.071429 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.285714 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 14.000000 & 5.000000 & -2.000000 & 30.000000 \\ 0.000000 & 15.142857 & 3.142857 & 5.857143 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \end{bmatrix}$$

$$P = \begin{bmatrix} 0.000000 & 0.000000 & 0.000000 & 1.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 1.000000 & 0.000000 & 0.000000 & 0.000000 \end{bmatrix}$$

Etapa 2

$$\begin{bmatrix} 14.000000 & 5.000000 & -2.000000 & 30.000000 \\ 0.000000 & 15.142857 & 3.142857 & 5.857143 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & 1.075472 & -4.632075 \end{bmatrix}$$

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.071429 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & -0.085849 & 1.000000 & 0.000000 \\ 0.285714 & -0.160377 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 14.000000 & 5.000000 & -2.000000 & 30.000000 \\ 0.000000 & 15.142857 & 3.142857 & 5.857143 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \end{bmatrix}$$

$$P = \begin{bmatrix} 0.000000 & 0.000000 & 0.000000 & 1.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 1.000000 & 0.000000 & 0.000000 & 0.000000 \end{bmatrix}$$

Etapa 3

$$\begin{bmatrix} 14.000000 & 5.000000 & -2.000000 & 30.000000 \\ 0.000000 & 15.142857 & 3.142857 & 5.857143 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & 0.000000 & -4.169954 \end{bmatrix}$$

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.071429 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & -0.085849 & 1.000000 & 0.000000 \\ 0.285714 & -0.160377 & -0.288316 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 14.000000 & 5.000000 & -2.000000 & 30.000000 \\ 0.000000 & 15.142857 & 3.142857 & 5.857143 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & 0.000000 & -4.169954 \end{bmatrix}$$

$$P = \begin{bmatrix} 0.000000 & 0.000000 & 0.000000 & 1.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 1.000000 & 0.000000 & 0.000000 & 0.000000 \end{bmatrix}$$

Despues de aplicar sustitución progresiva y regresiva

$$x = \begin{bmatrix} 0.525109 \\ 0.255459 \\ -0.410480 \\ -0.281659 \end{bmatrix}$$

Crout

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Resultados:

Etapa 0

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 1.000000 & 15.500000 & 3.000000 & 8.000000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 14.000000 & 5.000000 & -2.000000 & 30.000000 \end{bmatrix}$$

Etapa 1

$$L = \begin{bmatrix} 4.000000 & 0.000000 & 0.000000 & 0.000000 \\ 1.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 14.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 1.000000 & -0.250000 & 0.000000 & 0.750000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 2

$$L = \begin{bmatrix} 4.000000 & 0.000000 & 0.000000 & 0.000000 \\ 1.000000 & 15.750000 & 0.000000 & 0.000000 \\ 0.000000 & -1.300000 & 1.000000 & 0.000000 \\ 14.000000 & 8.500000 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 1.000000 & -0.250000 & 0.000000 & 0.750000 \\ 0.000000 & 1.000000 & 0.190476 & 0.460317 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 3

$$L = \begin{bmatrix} 4.000000 & 0.000000 & 0.000000 & 0.000000 \\ 1.000000 & 15.750000 & 0.000000 & 0.000000 \\ 0.000000 & -1.300000 & -3.752381 & 0.000000 \\ 14.000000 & 8.500000 & -3.619048 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 1.000000 & -0.250000 & 0.000000 & 0.750000 \\ 0.000000 & 1.000000 & 0.190476 & 0.460317 \\ 0.000000 & 0.000000 & 1.000000 & -0.452623 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 4

$$L = \begin{bmatrix} 4.000000 & 0.000000 & 0.000000 & 0.000000 \\ 1.000000 & 15.750000 & 0.000000 & 0.000000 \\ 0.000000 & -1.300000 & -3.752381 & 0.000000 \\ 14.000000 & 8.500000 & -3.619048 & 13.949239 \end{bmatrix}$$

$$U = \begin{bmatrix} 1.000000 & -0.250000 & 0.000000 & 0.750000 \\ 0.000000 & 1.000000 & 0.190476 & 0.460317 \\ 0.000000 & 0.000000 & 1.000000 & -0.452623 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Despues de aplicar sustitución progresiva y regresiva

$$x = \begin{bmatrix} 0.525109 \\ 0.255459 \\ -0.410480 \\ -0.281659 \end{bmatrix}$$

Doolittle

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Resultados:

Etapa 0

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 1.000000 & 15.500000 & 3.000000 & 8.000000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 14.000000 & 5.000000 & -2.000000 & 30.000000 \end{bmatrix}$$

Etapa 1

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.250000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 3.500000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 2

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.250000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & -0.082540 & 1.000000 & 0.000000 \\ 3.500000 & 0.539683 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 3

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.250000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & -0.082540 & 1.000000 & 0.000000 \\ 3.500000 & 0.539683 & 0.964467 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & -3.752381 & 1.698413 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 4

$$L = \begin{bmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.250000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & -0.082540 & 1.000000 & 0.000000 \\ 3.500000 & 0.539683 & 0.964467 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & -3.752381 & 1.698413 \\ 0.000000 & 0.000000 & 0.000000 & 13.949239 \end{bmatrix}$$

Despues de aplicar sustitución progresiva y regresiva

$$x = \begin{bmatrix} 0.525109 \\ 0.255459 \\ -0.410480 \\ -0.281659 \end{bmatrix}$$

Chelosky

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Resultados:

Etapa 0

$$\begin{bmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 1.000000 & 15.500000 & 3.000000 & 8.000000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 14.000000 & 5.000000 & -2.000000 & 30.000000 \end{bmatrix}$$

Etapa 1

$$L = \begin{bmatrix} 2.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.500000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 7.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 2.000000 & -0.500000 & 0.000000 & 1.500000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 2

$$L = \begin{bmatrix} 2.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.500000 & 3.968627 & 0.000000 & 0.000000 \\ 0.000000 & -0.327569 & 1.000000 & 0.000000 \\ 7.000000 & 2.141799 & 0.000000 & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 2.000000 & -0.500000 & 0.000000 & 1.500000 \\ 0.000000 & 3.968627 & 0.755929 & 1.826828 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 3

$$L = \begin{bmatrix} 2.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.500000 & 3.968627 & 0.000000 & 0.000000 \\ 0.000000 & -0.327569 & 1.937106i & 0.000000 \\ 7.000000 & 2.141799 & 1.868275i & 1.000000 \end{bmatrix}$$

$$U = \begin{bmatrix} 2.000000 & -0.500000 & 0.000000 & 1.500000 \\ 0.000000 & 3.968627 & 0.755929 & 1.826828 \\ 0.000000 & 0.000000 & 1.937106i & -0.876778i \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{bmatrix}$$

Etapa 4

$$L = \begin{bmatrix} 2.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.500000 & 3.968627 & 0.000000 & 0.000000 \\ 0.000000 & -0.327569 & 1.937106i & 0.000000 \\ 7.000000 & 2.141799 & 1.868275i & 3.734868 \end{bmatrix}$$

$$U = \begin{bmatrix} 2.000000 & -0.500000 & 0.000000 & 1.500000 \\ 0.000000 & 3.968627 & 0.755929 & 1.826828 \\ 0.000000 & 0.000000 & 1.937106i & -0.876778i \\ 0.000000 & 0.000000 & 0.000000 & 3.734868 \end{bmatrix}$$

Despues de aplicar sustitución progresiva y regresiva

$$x = \begin{bmatrix} 0.525109 \\ 0.255459 \\ -0.410480 \\ -0.281659 \end{bmatrix}$$

Jacobi

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

$$Tol = 1e-7, Nmax = 100$$

Resultados:

$$T : \begin{bmatrix} 0 & 0.25 & 0 & -0.75 \\ -0.064516 & 0 & -0.193548 & -0.516129 \\ 0 & -0.325000 & 0 & 0.275000 \\ -0.466667 & -0.166667 & 0.066667 & 0 \end{bmatrix}$$

$$C : \begin{bmatrix} 0.250000 & 0.064516 & -0.250000 & 0.033333 \end{bmatrix}$$

Radio espectral: 0.753517

iter	x_1	x_2	x_3	x_4	Error
0	0	0	0	0	
1	0.25	0.064516	-0.25	0.033333	3.6e-01
2	0.241129	0.079570	-0.261801	-0.110753	1.5e-01
3	0.352957	0.156793	-0.306317	-0.109909	1.4e-01
4	0.371630	0.157759	-0.331183	-0.177933	7.5e-02
5	0.422890	0.196476	-0.350203	-0.188466	6.8e-02
6	0.440469	0.202287	-0.365683	-0.220108	4.0e-02
7	0.465653	0.220480	-0.376273	-0.230312	3.4e-02
8	0.477854	0.226172	-0.384992	-0.245803	2.2e-02
9	0.490895	0.235067	-0.391102	-0.253027	1.8e-02
10	0.498537	0.239137	-0.395979	-0.261002	1.3e-02
11	0.505536	0.243705	-0.399495	-0.265572	1.0e-02
12	0.510105	0.246292	-0.402236	-0.269834	7.3e-03
13	0.513948	0.248727	-0.404249	-0.272580	5.7e-03
14	0.516617	0.250286	-0.405796	-0.274914	4.2e-03
15	0.518757	0.251618	-0.406944	-0.276522	3.2e-03
16	0.520296	0.252532	-0.407819	-0.277819	2.4e-03
17	0.521498	0.253272	-0.408473	-0.278748	1.8e-03
18	0.522379	0.253801	-0.408969	-0.279476	1.4e-03
19	0.523057	0.254215	-0.409341	-0.280008	1.0e-03
20	0.523560	0.254518	-0.409622	-0.280418	7.7e-04
21	0.523943	0.254752	-0.409834	-0.280723	5.8e-04
22	0.524230	0.254925	-0.409993	-0.280954	4.4e-04
23	0.524447	0.255057	-0.410113	-0.281128	3.3e-04
24	0.524610	0.255156	-0.410204	-0.281259	2.5e-04
25	0.524733	0.255231	-0.410272	-0.281358	1.9e-04
26	0.524826	0.255287	-0.410323	-0.281432	1.4e-04
27	0.524896	0.255329	-0.410362	-0.281488	1.1e-04
28	0.524948	0.255361	-0.410391	-0.281530	8.0e-05
29	0.524988	0.255385	-0.410413	-0.281562	6.0e-05
30	0.525018	0.255403	-0.410430	-0.281586	4.6e-05
31	0.525040	0.255417	-0.410442	-0.281604	3.4e-05
32	0.525057	0.255427	-0.410452	-0.281618	2.6e-05
33	0.525070	0.255435	-0.410459	-0.281628	1.9e-05
34	0.525080	0.255441	-0.410464	-0.281636	1.5e-05
35	0.525087	0.255445	-0.410468	-0.281642	1.1e-05
36	0.525092	0.255448	-0.410471	-0.281646	8.3e-06
37	0.525097	0.255451	-0.410473	-0.281649	6.3e-06
38	0.525100	0.255453	-0.410475	-0.281652	4.7e-06
39	0.525102	0.255454	-0.410476	-0.281654	3.6e-06
40	0.525104	0.255455	-0.410477	-0.281655	2.7e-06
41	0.525105	0.255456	-0.410478	-0.281656	2.0e-06
42	0.525106	0.255457	-0.410479	-0.281657	1.5e-06
43	0.525107	0.255457	-0.410479	-0.281658	1.1e-06
44	0.525107	0.255457	-0.410479	-0.281658	8.7e-07
45	0.525108	0.255458	-0.410480	-0.281658	6.5e-07
46	0.525108	0.255458	-0.410480	-0.281659	4.9e-07
51	0.525109	0.255458	-0.410480	-0.281659	1.2e-07
47	0.525108	0.255458	-0.410480	-0.281659	3.7e-07
48	0.525109	0.255458	-0.410480	-0.281659	2.8e-07
49	0.525109	0.255458	-0.410480	-0.281659	2.1e-07
50	0.525109	0.255458	-0.410480	-0.281659	1.6e-07
52	0.525109	0.255458	-0.410480	-0.281659	9.0e-08

Gauss-Sediel

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

$$Tol = 1e-7, Nmax = 100$$

Resultados:

$$T : \begin{bmatrix} 0 & 0.25 & 0 & -0.75 \\ 0 & -0.016129 & -0.193548 & -0.467742 \\ 0 & 0.005242 & 0.062903 & 0.427016 \\ 0 & -0.113629 & 0.036452 & 0.456425 \end{bmatrix}$$

$$C : \begin{bmatrix} 0.250000 & 0.048387 & -0.265726 & -0.109113 \end{bmatrix}$$

Radio espectral: 0.599488

iter	x_1	x_2	x_3	x_4	Error
0	0	0	0	0	
1	0.25	0.048387	-0.265726	-0.109113	3.8e-01
2	0.343931	0.150074	-0.328780	-0.174099	1.7e-01
3	0.418093	0.191035	-0.359964	-0.217613	1.0e-01
4	0.460969	0.216763	-0.380292	-0.243265	6.0e-02
5	0.486640	0.232281	-0.392389	-0.258638	3.6e-02
6	0.502049	0.241563	-0.399633	-0.267859	2.1e-02
7	0.511285	0.247128	-0.403978	-0.273386	1.3e-02
8	0.516822	0.250465	-0.406582	-0.276700	7.7e-03
9	0.520141	0.252465	-0.408143	-0.278686	4.6e-03
10	0.522131	0.253664	-0.409079	-0.279877	2.8e-03
11	0.523324	0.254383	-0.409640	-0.280591	1.7e-03
12	0.524039	0.254814	-0.409977	-0.281019	1.0e-03
13	0.524467	0.255072	-0.410179	-0.281275	6.0e-04
14	0.524724	0.255227	-0.410299	-0.281429	3.6e-04
15	0.524879	0.255320	-0.410372	-0.281521	2.1e-04
16	0.524971	0.255375	-0.410415	-0.281577	1.3e-04
17	0.525026	0.255409	-0.410441	-0.281610	7.7e-05
18	0.525059	0.255429	-0.410457	-0.281630	4.6e-05
19	0.525079	0.255441	-0.410466	-0.281642	2.8e-05
20	0.525091	0.255448	-0.410472	-0.281649	1.7e-05
21	0.525098	0.255452	-0.410475	-0.281653	1.0e-05
22	0.525103	0.255455	-0.410477	-0.281656	6.0e-06
23	0.525105	0.255456	-0.410479	-0.281657	3.6e-06
24	0.525107	0.255457	-0.410479	-0.281658	2.1e-06
25	0.525108	0.255458	-0.410480	-0.281659	1.3e-06
26	0.525108	0.255458	-0.410480	-0.281659	7.7e-07
27	0.525109	0.255458	-0.410480	-0.281659	4.6e-07
28	0.525109	0.255458	-0.410480	-0.281659	2.8e-07
29	0.525109	0.255458	-0.410480	-0.281659	1.7e-07
30	0.525109	0.255458	-0.410480	-0.281659	9.9e-08

Sor

$$A = \begin{bmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

$$Tol = 1e-7, Nmax = 100, w = 1.5$$

Resultados:

$$T : \begin{bmatrix} -0.5 & 0.375 & 0 & -1.125 \\ 0.048387 & -0.536290 & -0.290323 & -0.665323 \\ -0.023589 & 0.261442 & -0.358468 & 0.736845 \\ 0.335544 & -0.102283 & 0.036734 & 0.527515 \end{bmatrix}$$

$$C : \begin{bmatrix} 0.375000 & 0.060484 & -0.404486 & -0.268070 \end{bmatrix}$$

Radio espectral: 0.631208

iter	x_1	x_2	x_3	x_4	Error
0	0	0	0	0	
1	0.375	0.060484	-0.404486	-0.268070	6.2e-01
2	0.511760	0.341976	-0.450049	-0.304696	3.2e-01
3	0.590144	0.235228	-0.390336	-0.308594	1.5e-01
4	0.515306	0.281526	-0.444371	-0.271236	1.1e-01
5	0.528060	0.243909	-0.383605	-0.283362	7.4e-02
6	0.521218	0.255125	-0.424458	-0.279399	4.3e-02
7	0.524387	0.258003	-0.403799	-0.282252	2.1e-02
8	0.527091	0.252514	-0.412630	-0.282229	1.1e-02
9	0.523655	0.258137	-0.410946	-0.281073	6.9e-03
10	0.526181	0.253697	-0.409146	-0.282129	5.5e-03
11	0.524441	0.256380	-0.411790	-0.281318	4.2e-03
12	0.525405	0.255085	-0.409503	-0.281846	2.8e-03
13	0.525031	0.255513	-0.411073	-0.281584	1.7e-03
14	0.525084	0.255547	-0.410197	-0.281673	8.8e-04
15	0.525171	0.255337	-0.410569	-0.281674	4.4e-04
16	0.525049	0.255562	-0.410493	-0.281637	2.7e-04
17	0.525153	0.255389	-0.410431	-0.281679	2.2e-04
18	0.525083	0.255497	-0.410532	-0.281646	1.7e-04
19	0.525122	0.255443	-0.410441	-0.281667	1.1e-04
20	0.525106	0.255461	-0.410504	-0.281656	6.8e-05
21	0.525108	0.255462	-0.410469	-0.281660	3.6e-05
22	0.525111	0.255454	-0.410484	-0.281660	1.8e-05
23	0.525107	0.255463	-0.410481	-0.281659	1.1e-05
24	0.525111	0.255456	-0.410479	-0.281660	8.4e-06
25	0.525108	0.255460	-0.410482	-0.281659	6.6e-06
26	0.525110	0.255458	-0.410479	-0.281660	4.5e-06
27	0.525109	0.255459	-0.410481	-0.281659	2.7e-06
28	0.525109	0.255459	-0.410480	-0.281659	1.5e-06
29	0.525109	0.255458	-0.410481	-0.281659	7.2e-07
30	0.525109	0.255459	-0.410480	-0.281659	4.2e-07
31	0.525109	0.255458	-0.410480	-0.281659	3.3e-07
32	0.525109	0.255459	-0.410480	-0.281659	2.6e-07
33	0.525109	0.255458	-0.410480	-0.281659	1.8e-07
34	0.525109	0.255459	-0.410480	-0.281659	1.1e-07
35	0.525109	0.255459	-0.410480	-0.281659	5.9e-08

Vendermonde

x	-1	0	3	4
y	15.5	3	8	1

Resultados:

Matriz de Vandermonde:

$$\begin{bmatrix} -1 & 1 & -1 & 1 \\ 0 & 0 & 0 & 1 \\ 27 & 9. & 3 & 1 \\ 64 & 16. & 4 & 1 \end{bmatrix}$$

Coeficientes del polinomio:

$$\begin{bmatrix} -1.141667 & 5.825 & -5.533333 & 3 \end{bmatrix}$$

Polinomio:

$$-1.141667x^3 + 5.825x^2 - 5.533333x + 3$$

Newton

x	-1	0	3	4
y	15.5	3	8	1

Resultados:

Tabla de diferencias divididas:

15.5	0	0	0
3	-12.5	0	0
8	1.666667	3.541667	0
1	-7	-2.166667	-1.141667

Coeficientes del polinomio de Newton:

$$\begin{bmatrix} 15.5 & -12.5 & 3.541667 & -1.141667 \end{bmatrix}$$

Polinomio de Newton:

$$15.5 - 12.5(x+1) + 3.541667(x+1)x - 1.141667(x+1)x(x-3)$$

Lagrange

x	-1	0	3	4
y	15.5	3	8	1

Resultados:

Polinomios interpolantes de Lagrange:

$$L0 = -0.05x^3 + 0.35x^2 - 0.6x$$
$$L1 = 0.083333x^3 - 0.5x^2 - 0.416667x + 1$$
$$L2 = -0.083333x^3 + 0.25x^2 + 0.333333x$$
$$L3 = 0.05x^3 - 0.1x^2 - 0.15x$$

Polinomio:

$$15.5 * L0 + 3 * L1 + 8 * L2 + L3$$

Trazadores Lineaes

x	-1	0	3	4
y	15.5	3	8	1

Resultados:

Coeficientes de los trazadores:

$$\begin{bmatrix} -12.5 & 3 \\ 1.666667 & 3 \\ -7 & 29 \end{bmatrix}$$

Trazadores:

$$-12.5x + 3$$
$$1.666667x + 3$$
$$-7x + 29$$

Trazadores Cuadráticos

x	-1	0	3	4
y	15.5	3	8	1

Resultados:

Coeficientes de los trazadores:

$$\begin{bmatrix} 0 & -12.5 & 3 \\ 4.722222 & -12.5 & 3 \\ -22.833333 & 152.833333 & -245 \end{bmatrix}$$

Trazadores:

$$-12.5x + 3$$
$$4.722222x^2 - 12.5x + 3$$
$$-22.833333x^2 + 152.833333x - 245$$

Trazadores Cúbicos

x	-1	0	3	4
y	15.5	3	8	1

Resultados:

Coeficientes de los trazadores:

$$\begin{bmatrix} 2.533333 & 7.6 & -7.433333 & 3 \\ -1.522222 & 7.6 & -7.433333 & 3 \\ 2.033333 & -24.4 & 88.566667 & -93 \end{bmatrix}$$

Trazadores:

$$2.533333x^3 + 7.6x^2 - 7.433333x + 3$$
$$-1.522222x^3 + 7.6x^2 - 7.433333x + 3$$
$$2.033333x^3 - 24.4x^2 + 88.566667x - 93$$