Análisis Numérico - Entraga 2

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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

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

Resultados:

Etapa 0

$$\begin{pmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 1.000000 & 15.500000 & 3.000000 & 8.000000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 14.000000 & 5.000000 & -2.000000 & 30.0000000 \end{pmatrix}$$

Etapa 1

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

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

$$U = \begin{pmatrix} 4.000000 & -1.000000 & 0.000000 & 3.0000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \end{pmatrix}$$

Etapa 2

$$\begin{pmatrix} 4.000000 & -1.000000 & 0.0000000 & 3.000000 \\ 0.000000 & 15.750000 & 3.000000 & 7.250000 \\ 0.000000 & 0.000000 & -3.752381 & 1.698413 \\ 0.000000 & 0.000000 & -3.619048 & 15.587302 \\ \end{pmatrix}$$

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

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

Etapa 3

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

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

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

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

LU con Pivoteo Parcial

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

Resultados:

Etapa0

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

Etapa 1

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

$$L = \begin{pmatrix} 1.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.071429 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.285714 & 0.000000 & -2.000000 & 30.000000 \\ 0.000000 & 15.142857 & 3.142857 & 5.857143 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 1.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.071429 & 1.000000 & 0.000000 & 0.000000 \\ 0.0285714 & -0.160377 & 0.000000 & 0.000000 \\ 0.000000 & 5.000000 & -2.000000 & 30.000000 \\ 0.000000 & 5.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 1.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.000000 & 0.000000 & -2.000000 & 30.000000 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & -0.000000 & -4.169954 \end{pmatrix}$$

$$L = \begin{pmatrix} 1.000000 & 0.000000 & -2.000000 & 30.000000 \\ 0.071429 & 1.000000 & 0.000000 & -4.169954 \end{pmatrix}$$

$$L = \begin{pmatrix} 1.000000 & 0.000000 & -2.000000 & 30.000000 \\ 0.071429 & 1.000000 & 0.000000 & -4.169954 \end{pmatrix}$$

$$L = \begin{pmatrix} 1.000000 & 0.000000 & -0.000000 & -0.000000 \\ 0.071429 & 1.000000 & 0.000000 & -0.000000 \\ 0.000000 & -0.085849 & 1.000000 & 0.000000 \\ 0.071429 & 1.000000 & 0.000000 & -4.169954 \end{pmatrix}$$

$$L = \begin{pmatrix} 1.000000 & 0.000000 & -0.000000 & -0.000000 \\ 0.071429 & 1.000000 & 0.000000 & -0.000000 \\ 0.000000 & 0.000000 & -3.730189 & 1.602830 \\ 0.000000 & 0.000000 & -0.000000 & -4.169954 \end{pmatrix}$$

$$L = \begin{pmatrix} 0.000000 & 0.000000 & 0.000000 & -0.000000 \\ 0.000000 & 0.000000 & 0.00$$

0.000000

0.000000

0.000000

1.000000

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

Crout

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

Resultados:

Etapa 0

$$\begin{pmatrix} 4.000000 & -1.000000 & 0.000000 & 3.000000 \\ 1.000000 & 15.500000 & 3.000000 & 8.000000 \\ 0.000000 & -1.300000 & -4.000000 & 1.100000 \\ 14.000000 & 5.000000 & -2.000000 & 30.0000000 \end{pmatrix}$$

Etapa 1

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

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

Etapa 2

$$L = \begin{pmatrix} 4.000000 & 0.000000 & 0.000000 & 0.0000000 \\ 1.000000 & 15.750000 & 0.000000 & 0.000000 \\ 0.000000 & -1.300000 & 1.000000 & 0.000000 \\ 14.000000 & 8.500000 & 0.000000 & 1.000000 \end{pmatrix}$$

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

Etapa 3

$$L = \begin{pmatrix} 4.000000 & 0.000000 & 0.000000 & 0.0000000 \\ 1.000000 & 15.750000 & 0.000000 & 0.000000 \\ 0.000000 & -1.300000 & -3.752381 & 0.000000 \\ 14.000000 & 8.500000 & -3.619048 & 1.000000 \end{pmatrix}$$

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

Etapa 4

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

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

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

Doolittle

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

Resultados:

Etapa 0

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

Etapa 1

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

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

Etapa 2

0.000000

1.000000

0.000000

1.000000

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

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

Etapa 3

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

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

Etapa 4

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

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

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

Chelosky

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

Resultados:

Etapa 0

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

Etapa 1

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

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

Etapa 2

$$L = \begin{pmatrix} 2.000000 & 0.000000 & 0.000000 & 0.000000 \\ 0.500000 & 3.968627 & 0.000000 & 0.000000 \\ 0.000000 & -0.327569 & 1.000000 & 0.000000 \\ 7.000000 & 2.141799 & 0.000000 & 1.000000 \\ 0.000000 & 3.968627 & 0.755929 & 1.826828 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.000000 & 0.000000 & 1.000000 & 0.000000 \\ 0.500000 & 3.968627 & 0.000000 & 0.000000 \\ 0.500000 & 3.968627 & 0.000000 & 0.000000 \\ 0.000000 & -0.327569 & 1.937106i & 0.000000 \\ 7.000000 & 2.141799 & 1.868275i & 1.000000 \\ 0.000000 & 3.968627 & 0.755929 & 1.826828 \\ 0.000000 & 3.968627 & 0.755929 & 1.826828 \\ 0.000000 & 0.000000 & 1.937106i & -0.876778i \\ 0.000000 & 0.000000 & 0.000000 & 1.000000 \end{pmatrix}$$

Etapa 4

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

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

Despues de aplicar sustitución progresiva y regresiva

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

Jacobi

$$A = \begin{pmatrix} 4 & -1 & 0 & 3\\ 1 & 15.5 & 3 & 8\\ 0 & -1.3 & -4 & 1.1\\ 14 & 5 & -2 & 30 \end{pmatrix} b = \begin{pmatrix} 1\\ 1\\ 1\\ 1 \end{pmatrix}$$
$$Tol = 1e - 7, Nmax = 100$$

Resultados:

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

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

Radio espectral: 0.753517

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 -0.360317 -0.109909 1.4e-01 4 0.371630 0.157759 -0.331183 -0.177933 7.5e-02 5 0.422890 0.196476 -0.350203 -0.184666 6.8e-02 7 0.465633 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 0.233137 -0.3999495 -0.261002 1.3e-02 11 0.505536 0.248705 -0.399495 -0.261002 1.3e-02 12 0.510105 0.246292 -0.402236 -0.269834 7.3e-03 13 0.513948 0.248727<	iter	x_1	x_2	x_3	x_4	Error
2 0.241129 0.079570 -0.261801 -0.110753 1.5e-01 3 0.352957 0.156793 -0.331183 -0.177933 7.5e-02 5 0.422890 0.196476 -0.350203 -0.184866 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 0.2330137 -0.395979 -0.261002 1.3e-02 11 0.505536 0.243705 -0.399495 -0.265827 1.0e-02 12 0.510105 0.246292 -0.40236 -0.269834 7.3e-03 13 0.518757 0.251618 -0.406944 -0.275280 7.7e-03 14 0.516175 0.251618 -0.406944 -0.278748 1.8e-03	0	0	0	0	0	
3 0.352957 0.156759 -0.306317 -0.109909 1.4e-01 4 0.371630 0.157759 -0.350203 -0.188466 6.8e-02 5 0.422890 0.196476 -0.350203 -0.188466 6.8e-02 6 0.440469 0.020287 -0.365683 -0.220108 4.0e-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 -0.399495 -0.265572 1.0e-02 11 0.505536 0.243705 -0.399195 -0.269834 7.3e-03 13 0.513948 0.248727 -0.402236 -0.269834 7.3e-03 13 0.513948 0.248727 -0.405796 -0.274914 4.2e-03 15 0.518757 0.251618 -0.406944 -0.277819 2.4e-03 16 0.520296 0.252532 -0.407819 -0.277878 1.8e-03	1	0.25	0.064516	-0.25	0.033333	3.6e-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 -0.39102 -0.253027 1.8e-02 10 0.498537 0.233137 -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 -0.277819 4.2e-03 16 0.52096 0.252532 -0.407819 -0.277819 1.4e-03	2	0.241129	0.079570	-0.261801	-0.110753	1.5e-01
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 -0.399102 -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 -0.402449 -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 -0.277814 4.2e-03 17 0.521498 0.253272 -0.408947 -0.277946 1.4e-03	3	0.352957	0.156793	-0.306317	-0.109909	1.4e-01
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 -0.39197 -0.265027 1.8e-02 10 0.498537 0.239137 -0.399495 -0.265572 1.0e-02 11 0.505536 0.247705 -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 -0.272850 5.7e-03 14 0.516617 0.250286 -0.405796 -0.274914 4.2e-03 15 0.518757 0.251618 -0.406474 -0.277819 2.4e-03 16 0.520296 0.252532 -0.407819 -0.278476 1.4e-03 18 0.521498 0.253361 -0.408473 -0.278476 1.4e-03	4	0.371630	0.157759	-0.331183	-0.177933	7.5e-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 -0.39197 -0.265027 1.8e-02 10 0.498537 0.239137 -0.399495 -0.265572 1.0e-02 11 0.505536 0.247705 -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 -0.272850 5.7e-03 14 0.516617 0.250286 -0.405796 -0.274914 4.2e-03 15 0.518757 0.251618 -0.406474 -0.277819 2.4e-03 16 0.520296 0.252532 -0.407819 -0.278476 1.4e-03 18 0.521498 0.253361 -0.408473 -0.278476 1.4e-03	5	0.422890	0.196476	-0.350203	-0.188466	6.8e-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 -0.40236 -0.269834 7.3e-03 13 0.516617 0.250286 -0.405796 -0.274914 4.2e-03 15 0.51677 0.251618 -0.406944 -0.276522 3.2e-03 16 0.520296 0.252532 -0.407819 -0.278719 2.4e-03 17 0.521498 0.252372 -0.408473 -0.278719 2.4e-03 18 0.522379 0.253801 -0.409341 -0.280008 1.0e-03 20 0.523660 0.254515 -0.409341 -0.28008 1.7e-04	6	0.440469	0.202287	-0.365683	-0.220108	4.0e-02
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						1
	52					l

Gauss-Sediel

$$A = \begin{pmatrix} 4 & -1 & 0 & 3 \\ 1 & 15.5 & 3 & 8 \\ 0 & -1.3 & -4 & 1.1 \\ 14 & 5 & -2 & 30 \end{pmatrix} b = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}$$
$$Tol = 1e - 7, Nmax = 100$$

Resultados:

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

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

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

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

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

Resultados:

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

 $C: (0.375000 \quad 0.060484 \quad -0.404486 \quad -0.268070)$

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
У	15.5	3	8	1

Resultados:

Matriz de Vandermonde:

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

Coeficientes del polinomio:

$$(-1.141667 \quad 5.825 \quad -5.533333 \quad 3)$$

Polinomio:

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

Newton

X	-1	0	3	4
У	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:

$$(15.5 - 12.53.541667 - 1.141667)$$

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
У	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
у	15.5	3	8	1

Resultados:

Coeficientes de los trazadores:

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

Trazadores:

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

Trazadores Cuadráticos

X	-1	0	3	4
У	15.5	3	8	1

Resultados:

Coeficientes de los trazadores:

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

Trazadores:

$$-12.5x + 3$$

$$4.722222x^{2} - 12.5x + 3$$

$$-22.833333x^{2} + 152.833333x - 245$$

Trazadores Cúbicos

X	-1	0	3	4
У	15.5	3	8	1

Resultados:

Coeficientes de los trazadores:

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

Trazadores:

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