UA

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100

Resuelve los sistemas por el método indicado

$$-3x_1 - 6x_2 - 2x_3 = -61.5$$
$$10x_1 + 2x_2 - x_3 = 27$$
$$x_1 + x_2 + 5x_3 = -21.5$$

Factorización LU

$$A = \begin{bmatrix} -3 & -6 & -2 \\ 10 & 2 & -1 \\ 1 & 1 & 5 \end{bmatrix}, \quad X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}, \quad b = \begin{bmatrix} -61.5 \\ 27 \\ -21.5 \end{bmatrix}$$

$A \rightarrow U$

$$\begin{bmatrix} -3 & -6 & -2 \\ 10 & 2 & -1 \\ 1 & 1 & 5 \end{bmatrix} \begin{matrix} R_2^* = R_2 + \frac{10}{3}R_1 \\ R_3^* = R_3 + \frac{1}{3}R_1 \end{matrix} \rightarrow \begin{bmatrix} -3 & -6 & -2 \\ 0 & -18 & -23/3 \\ 0 & -1 & 13/3 \end{bmatrix} R_3^* = R_3 - \frac{1}{18}R_2$$

$$\rightarrow \begin{bmatrix} -3 & -6 & -2 \\ 0 & -18 & -23/3 \\ 0 & 0 & 257/54 \end{bmatrix}$$

$l_{21} = -\frac{10}{3}$ | $l_{31} = -\frac{1}{3}$ | $l_{32} = \frac{1}{18}$ |

$$L = \begin{bmatrix} 1 & 0 & 0 \\ -10/3 & 1 & 0 \\ -1/3 & 1/18 & 1 \end{bmatrix}$$

$Ld = b$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -61.5 \\ -10/3 & 1 & 0 & 27 \\ -1/3 & 1/18 & 1 & -21.5 \end{array}\right] \rightarrow \text{Calcular } d$$

$d_1 = -61.5$ |

$-\frac{10}{3}d_1 + d_2 = 27$

$-\frac{10}{3}(-61.5) + d_2 = 27 \rightarrow d_2 = -178$ |

$-\frac{1}{3}d_1 + \frac{1}{18}d_2 + d_3 = -21 \therefore -\frac{1}{3}(-61.5) + \frac{1}{18}(-178) + d_3 = -21.5 \rightarrow d_3 = -\frac{289}{9}$ |

$$d = \begin{bmatrix} -61.5 \\ -178 \\ -289/9 \end{bmatrix}$$

$Ux = d$

$$\begin{bmatrix} -3 & -6 & -2 \\ 0 & -18 & -23/3 \\ 0 & 0 & 257/54 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -61.5 \\ -178 \\ -289/9 \end{bmatrix}$$

Sustitución hacia atrás

$$\frac{257}{54} x_3 = -\frac{289}{9} \longrightarrow x_3 = -\frac{1734}{257}$$

$$-18x_2 - \frac{23}{3} x_3 = -178$$

$$18x_2 + \frac{23}{3} x_3 = 178$$

$$18x_2 + \frac{23}{3}\left(-\frac{1734}{257}\right) = 178 \longrightarrow x_2 = \frac{3280}{257}$$

$$-3x_1 - 6x_2 - 2x_3 = -61.5$$

$$3x_1 + 6x_2 + 2x_3 = 61.5$$

$$3x_1 + 6\left(\frac{3280}{257}\right) + 2\left(-\frac{1734}{257}\right) = 61.5 \longrightarrow x_1 = -\frac{271}{514}$$

$$\therefore \quad x = \begin{bmatrix} -271/514 \\ 3280/257 \\ -1734/257 \end{bmatrix}$$

~~Gauss - Sei~~

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$4x_1 + x_2 - x_3 = 9$
$3x_1 + 2x_2 - 6x_3 = -2$
$x_1 - 5x_2 + 3x_3 = 1$

Gauss - Seidel

$P_0(3, 2, 3)$

$4x_1 + x_2 - x_3 = 9$
$x_1 - 5x_2 + 3x_3 = 1$
$3x_1 + 2x_2 - 6x_3 = -2$

$$x_1 = \frac{9 + x_3 - x_2}{4}$$

$$x_2 = \frac{1 - 3x_3 - x_1}{-5}$$

$$x_3 = \frac{-2 - 2x_2 - 3x_1}{-6} = \frac{2 + 2x_2 + 3x_1}{6}$$

Iteración	x_1	x_2	x_3	E_{a1}	E_{a2}	E_{a3}
0	3	2	3	No hay error	No hay error	No hay error
1	2.5	2.1	2.2833	20%	4.7619%	31.3888%
2	2.2958	1.6291	2.0243	8.8945%	28.9055%	12.7945%
3	2.3488	1.4843	2.0025	2.2563%	9.7554%	1.0886%
4	2.3796	1.4774	2.0156	1.2943%	0.467%	0.6499%
5	2.3846	1.4863	2.0211	0.2097%	0.5988%	0.2721%

$P_5(2.3846, 1.4863, 2.0211)$

$E_{a1} = 0.2097\%$ $E_{a2} = 0.5988\%$ $E_{a3} = 0.2721\%$