

Ecuación 1

Nombre: <u>Ramos Hernández Antonio</u>	Día: <u> </u>	Mes: <u> </u>	Año: <u> </u>	Folio: <u> </u>
Tema: <u> </u>				

De los siguientes sistemas de ecuaciones, obtener la solución realizando:

- 4 iteraciones completas utilizando Gauss-Seidel

①

$$\begin{aligned}9x + 2y - z &= -2 \\7x + 8y + 5z &= 3 \\3x + 4y - 10z &= 6\end{aligned}$$
$$x = -\frac{2}{9} - \frac{2}{9}y + \frac{1}{9}z = \frac{1}{9}(-2 - 2y + z)$$
$$= 0.1(-2 - 2y + z)$$
$$y = \frac{3}{8} - \frac{7}{8}x - \frac{5}{8}z = \frac{1}{8}(3 - 7x - 5z)$$
$$= 0.125(3 - 7x - 5z)$$
$$z = -\frac{6}{10} + \frac{3}{10}x + \frac{4}{10}y = -\frac{3}{5} + \frac{3}{10}x + \frac{2}{5}y$$
$$= \frac{1}{5}(-3 + \frac{3}{2}x + 2y) = 0.2(-3 + 1.5x + 2y)$$
$$x_0 = 0 \quad y_0 = 0 \quad z_0 = 0$$

- Iteración 1

$$\begin{aligned}x_1 &= 0.1(-2 - 2(0) + (0)) = -0.2 \\y_1 &= 0.125(3 - 7(-0.2) - 5(0)) = 0.5694 \\z_1 &= 0.2(-3 + 1.5(-0.2) + 2(0.5694)) \\&= -0.438\end{aligned}$$

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• Iteración 2

$$x_2 = 0.1(-2 - 2(0.5694) + (-0.438)) = -0.39753$$

$$y_2 = 0.125(3 - 7(0.39753) - 5(-0.438))$$

$$= 0.99714$$

$$z_2 = 0.2(-3 + 1.5(-0.39753) + 2(0.99714))$$

$$= 0.32040$$

• Iteración 3

$$x_3 = 0.1(-2 - 2(0.99714) + (0.32040)) = -0.47941$$

$$y_3 = 0.125(3 - 7(-0.47941) - 5(0.32040))$$

$$= 0.99473$$

$$z_3 = 0.2(-3 + 1.5(-0.47941) + 2(0.99473))$$

$$= -0.34592$$

• Iteración 4

$$x_4 = 0.1(-2 - 2(0.99473) + (0.34592)) = -0.48171$$

$$y_4 = 0.125(3 - 7(-0.48171) + (0.99473)) = 1.01270$$

$$z_4 = 0.2(-3 + 1.5(-0.48171) + 2(1.01270))$$

$$= -0.33943$$

Ecuación 2

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②

$$\begin{aligned} 5x_1 + 2x_2 &= 12 \\ -x_1 + 10x_2 &= 8 \end{aligned}$$
$$x_1 = \frac{12}{5} - \frac{2}{5}x_2 = \frac{1}{5}(12 - 2x_2) = 0.2(12 - 2x_2)$$
$$x_2 = \frac{8}{10} + \frac{1}{10}x_1 = \frac{1}{5}(4 + \frac{1}{2}x_1) = 0.2(4 + 0.5x_1)$$
$$\begin{aligned} x_{10} &= 0 \\ x_{20} &= 0 \end{aligned}$$

Iteración 1

$$\begin{aligned} x_{11} &= 0.2(12 - 2(0)) = 2.4 \\ x_{21} &= 0.2(4 + 0.5(2.4)) = 1.04 \end{aligned}$$

Iteración 2

$$\begin{aligned} x_{12} &= 0.2(12 - 2(1.04)) = 1.984 \\ x_{22} &= 0.2(4 + 0.5(1.984)) = 0.9984 \end{aligned}$$

Iteración 3

$$\begin{aligned} x_{13} &= 0.2(12 - 2(0.9984)) = 2.00064 \\ x_{23} &= 0.2(4 + 0.5(2.00064)) = 1.000064 \end{aligned}$$

Iteración 4

$$\begin{aligned} x_{14} &= 0.2(12 - 2(1.000064)) = 1.99997 \\ x_{24} &= 0.2(4 + 0.5(1.99997)) = 0.999997 \end{aligned}$$

Ecuación 3

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Tema:

③

$$\begin{aligned} 8x_1 + x_2 &= 4 \\ 2x_1 + 5x_2 &= 3 \\ x_1 + 4x_3 &= 3 \end{aligned}$$

$$x_1 = \frac{4}{8} - \frac{1}{8}x_2 = \frac{1}{2} - \frac{1}{8}x_2 = \frac{1}{2}(1 - \frac{1}{4}x_2)$$

$$= 0.5(1 - 0.25x_2)$$

$$x_2 = \frac{3}{5} - \frac{2}{5}x_1 = \frac{1}{5}(3 - 2x_1) = 0.2(3 - 2x_1)$$

$$x_3 = \frac{3}{4} - \frac{1}{4}x_3 = \frac{1}{4}(3 - x_1) = 0.25(3 - x_1)$$

$$x_{10} = 0 \quad x_{20} = 0 \quad x_{30} = 0$$

• Iteración 1

$$\begin{aligned} x_{11} &= 0.5(1 - 0.25(0)) = 0.5 \\ x_{21} &= 0.2(3 - 2(0.5)) = 0.4 \\ x_{31} &= 0.25(3 - (0.5)) = 0.625 \end{aligned}$$

• Iteración 2

$$\begin{aligned} x_{12} &= 0.5(1 - 0.25(0.4)) = 0.45 \\ x_{22} &= 0.2(3 - 2(0.45)) = 0.42000 \\ x_{32} &= 0.25(3 - (0.45)) = 0.6375 \end{aligned}$$

• Iteración 3

$$\begin{aligned} x_{13} &= 0.5(1 - 0.25(0.42000)) = 0.4475 \\ x_{23} &= 0.2(3 - 2(0.4475)) = 0.42100 \\ x_{33} &= 0.25(3 - (0.45)) = 0.638125 \end{aligned}$$

• Iteración 4

$$\begin{aligned} x_{14} &= 0.5(1 - 0.25(0.42100)) = 0.44737 \\ x_{24} &= 0.2(3 - 2(0.44737)) = 0.42105 \\ x_{34} &= 0.25(3 - (0.44737)) = 0.63815 \end{aligned}$$

Ecuación 4

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④

$$\begin{aligned} 6x_1 + 2x_2 + x_3 &= 22 \\ -x_1 + 8x_2 + 2x_3 &= 20 \\ x_1 - x_2 + 6x_3 &= 23 \end{aligned}$$
$$\begin{aligned} x_1 &= \frac{22}{6} - \frac{2}{6}x_2 - \frac{1}{6}x_3 = \frac{11}{3} - \frac{1}{3}x_2 - \frac{1}{6}x_3 \\ &= \frac{1}{3}(11 - x_2 - \frac{1}{2}x_3) = 0.3(11 - x_2 - 0.5x_3) \end{aligned}$$
$$\begin{aligned} x_2 &= \frac{20}{8} + \frac{1}{8}x_1 - \frac{2}{8}x_3 = \frac{5}{2} + \frac{1}{8}x_1 - \frac{1}{4}x_3 \\ &= \frac{1}{2}(5 + \frac{1}{4}x_1 - \frac{1}{2}x_3) = 0.5(5 + 0.25x_1 - 0.5x_3) \end{aligned}$$
$$\begin{aligned} x_3 &= \frac{23}{6} - \frac{1}{6}x_1 + \frac{1}{6}x_2 = \frac{1}{6}(23 - x_1 + x_2) \\ &= 0.16(23 - x_1 + x_2) \end{aligned}$$
$$x_{10} = 0 \quad x_{20} = 0 \quad x_{30} = 0$$

• Iteración 1

$$\begin{aligned} x_{11} &= 0.3(11 - (0) - 0.5(0)) = 3.3 \\ x_{21} &= 0.5(5 + 0.25(3.3) - 0.5(0)) = 2.9583 \\ x_{31} &= 0.16(23 - (3.3) + (2.9583)) = 3.71527 \end{aligned}$$

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• Iteración 2

$$X_{12} = 0.3(11 - (2.9583) - 0.5(3.71527)) = 2.06134$$

$$X_{22} = 0.5(5 + 0.25(2.06134) - 0.5(3.71527)) = 1.82884$$

$$X_{32} = 0.16(23 - (2.06134) + (1.82884)) = 3.79458$$

• Iteración 3

$$X_{13} = 0.3(11 - (1.82884) - 0.5(3.79458)) = 2.42461$$

$$X_{23} = 0.5(5 + 0.25(2.42461) - 0.5(3.79458)) = 1.85443$$

$$X_{33} = 0.16(23 - (2.42461) + (1.85443)) = 3.73830$$

• Iteración 4

$$X_{14} = 0.3(11 - (1.85443) - 0.5(3.73830)) = 2.42547$$

$$X_{24} = 0.5(5 + 0.25(2.42547) - 0.5(3.73830)) = 1.86860$$

$$X_{34} = 0.16(23 - (2.42547) + (1.86860)) = 3.74052$$