The Jacobi update formulas for a 3×3 matrix are given below.

$$x_1^{(k+1)} = \frac{1}{A_{11}} \left(b_1 - A_{12} x_2^{(k)} - A_{13} x_3^{(k)} \right) \tag{1}$$

$$x_2^{(k+1)} = \frac{1}{A_{22}} \left(b_2 - A_{21} x_1^{(k)} - A_{23} x_3^{(k)} \right) \tag{2}$$

$$x_3^{(k+1)} = \frac{1}{A_{33}} \left(b_3 - A_{31} x_1^{(k)} - A_{32} x_2^{(k)} \right) \tag{3}$$

System 1:

Find $\mathbf{x}^{(1)}$, $\mathbf{x}^{(2)}$ and $\mathbf{x}^{(3)}$ by successive application of the update formulas.

$$A = \begin{bmatrix} 4 & 1 & 2 \\ -\frac{1}{2} & 3 & \frac{3}{2} \\ 0 & 2 & 4 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \quad \mathbf{x}^{(0)} = \begin{bmatrix} x_1^{(0)} \\ x_2^{(0)} \\ x_3^{(0)} \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

After 01 Jacobi iteration, $\mathbf{x}^{(1)} = \begin{bmatrix} x_1^{(1)} \\ x_2^{(1)} \\ x_3^{(1)} \end{bmatrix} = \begin{bmatrix} \quad \\ \quad \\ \quad \end{bmatrix}$

After 2 Jacobi iterations, $\mathbf{x}^{(2)} = \begin{bmatrix} x_1^{(2)} \\ x_2^{(2)} \\ x_3^{(2)} \end{bmatrix} = \begin{bmatrix} \quad \\ \quad \\ \quad \end{bmatrix}$

After 3 Jacobi iterations, $\mathbf{x}^{(3)} = \begin{bmatrix} x_1^{(3)} \\ x_2^{(3)} \\ x_3^{(3)} \end{bmatrix} = \begin{bmatrix} \quad \\ \quad \\ \quad \end{bmatrix}$

The Jacobi update formulas for a 3×3 matrix are given below.

$$x_1^{(k+1)} = \frac{1}{A_{11}} \left(b_1 - A_{12} x_2^{(k)} - A_{13} x_3^{(k)} \right) \tag{4}$$

$$x_2^{(k+1)} = \frac{1}{A_{22}} \left(b_2 - A_{21} x_1^{(k)} - A_{23} x_3^{(k)} \right) \tag{5}$$

$$x_3^{(k+1)} = \frac{1}{A_{33}} \left(b_3 - A_{31} x_1^{(k)} - A_{32} x_2^{(k)} \right) \tag{6}$$

System 2:

Find $\mathbf{x}^{(1)}$, $\mathbf{x}^{(2)}$ and $\mathbf{x}^{(3)}$ by successive application of the update formulas.

$$A = \begin{bmatrix} -1 & 3 & 2 \\ 4 & 5/2 & -1 \\ 0 & 3 & 1 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \quad \mathbf{x}^{(0)} = \begin{bmatrix} x_1^{(0)} \\ x_2^{(0)} \\ x_3^{(0)} \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

After 01 Jacobi iteration, $\mathbf{x}^{(1)} = \begin{bmatrix} x_1^{(1)} \\ x_2^{(1)} \\ x_3^{(1)} \end{bmatrix} = \begin{bmatrix} \quad \\ \quad \\ \quad \end{bmatrix}$

After 2 Jacobi iterations, $\mathbf{x}^{(2)} = \begin{bmatrix} x_1^{(2)} \\ x_2^{(2)} \\ x_3^{(2)} \end{bmatrix} = \begin{bmatrix} \quad \\ \quad \\ \quad \end{bmatrix}$

After 3 Jacobi iterations, $\mathbf{x}^{(3)} = \begin{bmatrix} x_1^{(3)} \\ x_2^{(3)} \\ x_3^{(3)} \end{bmatrix} = \begin{bmatrix} \quad \\ \quad \\ \quad \end{bmatrix}$