

## Jacobi Method - Questions

1. Apply the Jacobi Method to the problem

$$\begin{bmatrix} 2 & 1 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

with initial value

$$\mathbf{x}^{(0)} = \begin{bmatrix} \frac{1}{2} \\ 0 \end{bmatrix}.$$

What is the magnitude of the residual vector after five iterations?

2. Consider the system

$$\begin{bmatrix} 2 & 1 \\ 6 & \alpha \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}.$$

If the Jacobi Method is applied here, what must the value of  $\alpha$  be so that the residual after two iterations has unit magnitude? Assume

$$\mathbf{x}^{(0)} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}.$$

3. Which of the following coefficient matrices would not be suitable for the Jacobi Method:

(a)  $\begin{bmatrix} 2 & 1 \\ 1 & -4 \end{bmatrix}$

(b)  $\begin{bmatrix} -7 & 1 \\ 4 & 3 \end{bmatrix}$

(c)  $\begin{bmatrix} 2 & 1 & -1 \\ -1 & 0 & 0 \\ -2 & 1 & 8 \end{bmatrix}$

(d)  $\begin{bmatrix} 2 & 1 & -1 & 0 \\ 1 & -5 & 0 & 3 \\ -2 & 1 & 8 & 4 \\ -7 & 1 & 0 & 6 \end{bmatrix}$