

In Class Practice Problems

- 1) Compute the solution of the system $Ax = b$ where:

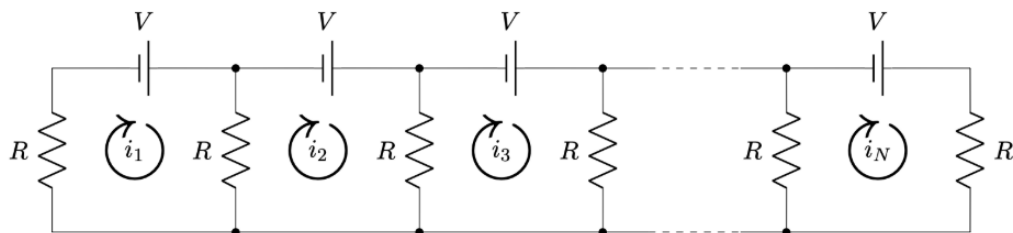
$$A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 0 & 2 \\ 4 & 3 & 4 \end{bmatrix} \quad b = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$$

- 2) Compute the norm of the residual $|b - Ax|$ for Problem 1.

- 3) Compute the solution of the system $Ax = b$ for:

$$A = \begin{bmatrix} 2R & -R & 0 & 0 & \cdots & 0 & 0 & 0 \\ -R & 2R & -R & 0 & & 0 & 0 & 0 \\ 0 & -R & 2R & -R & \cdots & 0 & 0 & 0 \\ \vdots & & \vdots & & \ddots & & \vdots & \\ 0 & 0 & 0 & 0 & \cdots & -R & 2R & -R \\ 0 & 0 & 0 & 0 & \cdots & 0 & -R & 2R \end{bmatrix} \quad b = \begin{bmatrix} V \\ \vdots \\ V \end{bmatrix}$$

Where A is a square matrix of size N , and R and V are some positive constants. The system is a mathematical model of a parallel circuit such that the solution consists of the loop currents i_1, \dots, i_n . Plot the loop current vs the loop current index.



4) Consider the $N \times N$ matrix:

$$A = \begin{bmatrix} 2 & -1 & & & \\ -1 & 2 & -1 & & \\ & \ddots & \ddots & \ddots & \\ & & -1 & 2 & -1 \\ & & & -1 & 2 \end{bmatrix}$$

Compute the solution of the system $Ax = b$ for:

$$\mathbf{b} = \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix}$$

By computing the LU decomposition and using the function `scipy.linalg.solve_triangular`.