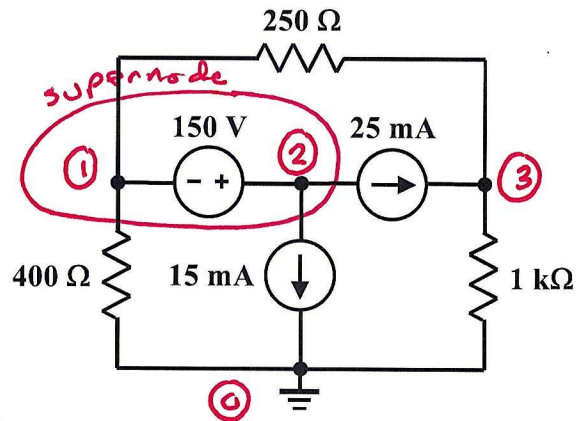


Homework Problem #019

Assign node labels and express the node equations in the matrix form discussed in class.



Do not attempt to solve the equations.

$$V_2 - V_1 = 150 \text{ V} \quad (\text{constraint equation for the supernode})$$

$$\frac{V_1 - V_3}{250 \Omega} + 25 \text{ mA} + 15 \text{ mA} + \frac{V_1}{400 \Omega} = 0 \quad (\text{KCL for the supernode})$$

$$\frac{V_3 - V_1}{250 \Omega} - 25 \text{ mA} + \frac{V_3}{1 \text{ k}\Omega} = 0 \quad (\text{KCL for node 3})$$

In matrix form:

$$\begin{bmatrix} -1 & 1 & 0 \\ \frac{1}{250} + \frac{1}{400} & 0 & -\frac{1}{250} \\ -\frac{1}{250} & 0 & \frac{1}{250} + \frac{1}{10^3} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 150 \\ -25 \times 10^{-3} - 15 \times 10^{-3} \\ 25 \times 10^{-3} \end{bmatrix}$$