

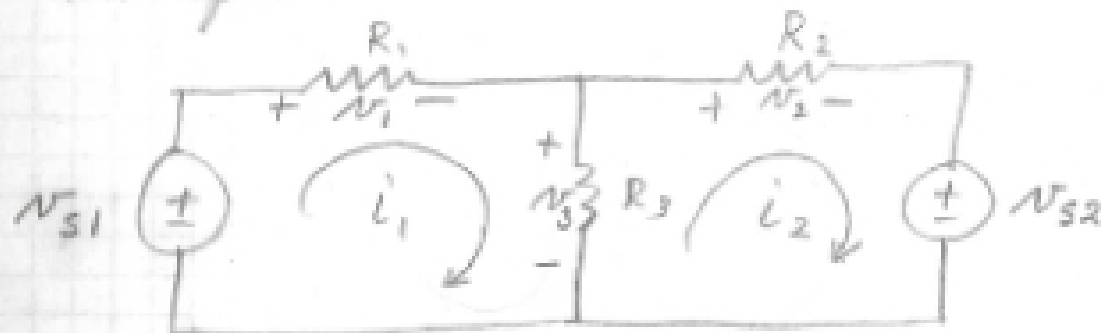
A. Mesh Analysis

3 ~ 2
TEST 2

Start

1. Solve for mesh currents instead of node voltages.
2. Loop - a closed path
3. Mesh - a loop with no interior elements
4. Use KVL

Example:



a) Assign mesh currents and voltages

b) Mesh 1:

$$\text{KVL: } -v_{s1} + v_1 + v_3 = 0$$

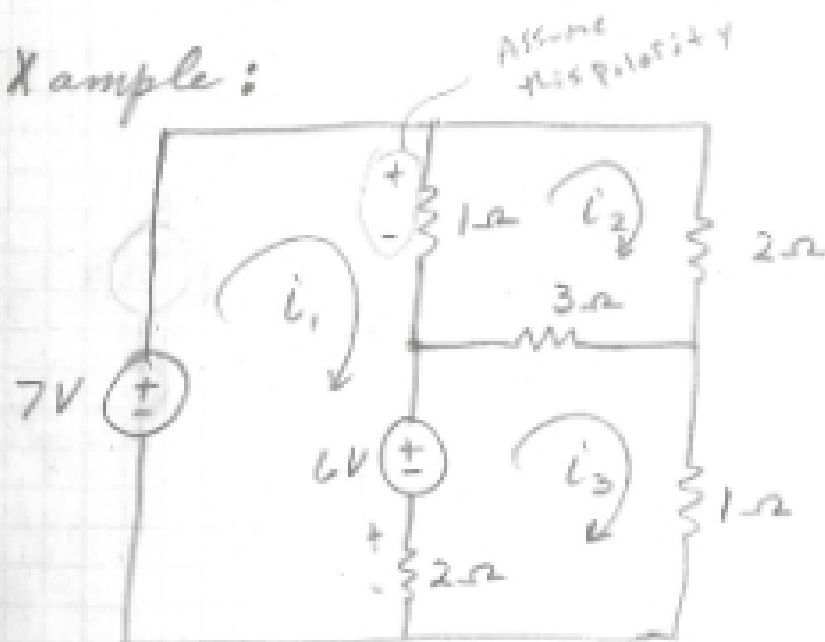
$$\text{Ohm's law: } -v_{s1} + i_1 R_1 + i_1 R_3 - i_2 R_3 = 0$$

Subtract
other currents
from other loop

d) Matrix form

$$\begin{bmatrix} (R_1 + R_3) & -R_3 \\ -R_3 & (R_2 + R_3) \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} V_{S1} \\ -V_{S2} \end{bmatrix}$$

Example:



$$\text{KVL: M1: } -7 + 1(i_1 - i_2) + 6 + 2(i_1 - i_3) = 0$$

$$\text{M2: } 1(i_2 - i_1) + 2i_2 + 3(i_2 - i_3) = 0$$

$$\text{M3: } 2(i_3 - i_1) - 6 + 3(i_3 - i_2) + i_3 = 0$$

$$\text{or } \begin{bmatrix} 3 & -1 & -2 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} 1 \end{bmatrix}$$