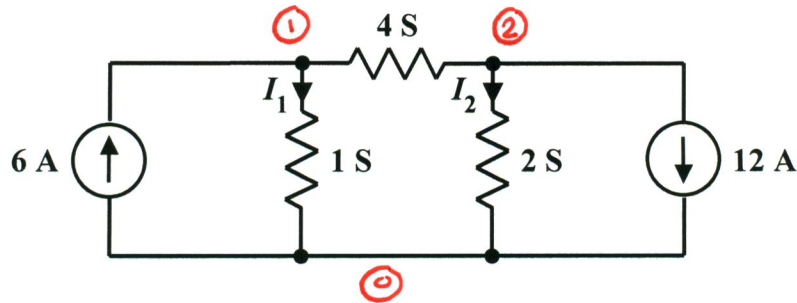


EE 2240
Problem #03

Use the nodal analysis method to determine the voltage across each conductance. Then apply Ohm's Law to determine the values of I_1 and I_2 .



$$-6 \text{ A} + 1V_1 + 4(V_1 - V_2) = 0 \quad (\text{KCL at node 1})$$

$$4(V_2 - V_1) + 2V_2 + 12 = 0 \quad (\text{KCL at node 2})$$

$$\begin{bmatrix} 5 & -4 \\ -4 & 6 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 6 \\ -12 \end{bmatrix}$$

$$V_1 = \frac{\begin{vmatrix} 6 & -4 \\ -12 & 6 \end{vmatrix}}{\begin{vmatrix} 5 & -4 \\ -4 & 6 \end{vmatrix}} = \frac{36 - 48}{30 - 16} = -\frac{12}{14} = -\frac{6}{7} \text{ V}$$

$$V_2 = \frac{\begin{vmatrix} 5 & 6 \\ -4 & -12 \end{vmatrix}}{14} = \frac{-60 + 24}{14} = -\frac{36}{14} = -\frac{18}{7} \text{ V}$$

$$V_{1,2} = V_1 - V_2 = -\frac{6}{7} + \frac{18}{7} = \frac{12}{7} \text{ V}$$

$$I_1 = (1\text{S})V_1 = -\frac{6}{7} \text{ A}$$

$$I_2 = (2\text{S})V_2 = -\frac{36}{7} \text{ A}$$