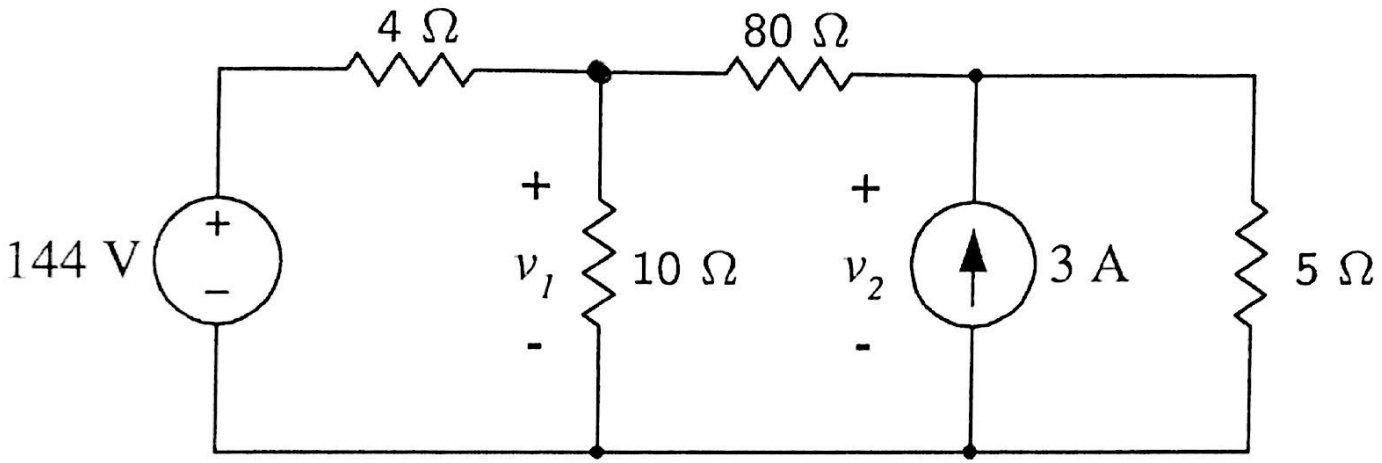
Example 3: Nodal Analysis



Solve for v_1 and v_2.

Node I) $\frac{V_1-144}{4} + \frac{V_1}{10} + \frac{V_1-V_2}{80} = 0$

(20) (8)

$20V_1 - 2880 + 8V_1 + V_1 - V_2 = 0$

$29V_1 - V_2 = 2880$

Node II) $\frac{V_2-V_1}{80} - 3 + \frac{V_2}{5} = 0$

(80) (16)

$V_2 - V_1 - 240 + 16V_2 = 0$

$17V_2 - V_1 = 240$

~~$V_1 = 107,4V$~~

~~$V_2 = 20,4V$~~

$V_1 = 100V$

$V_2 = 20V$

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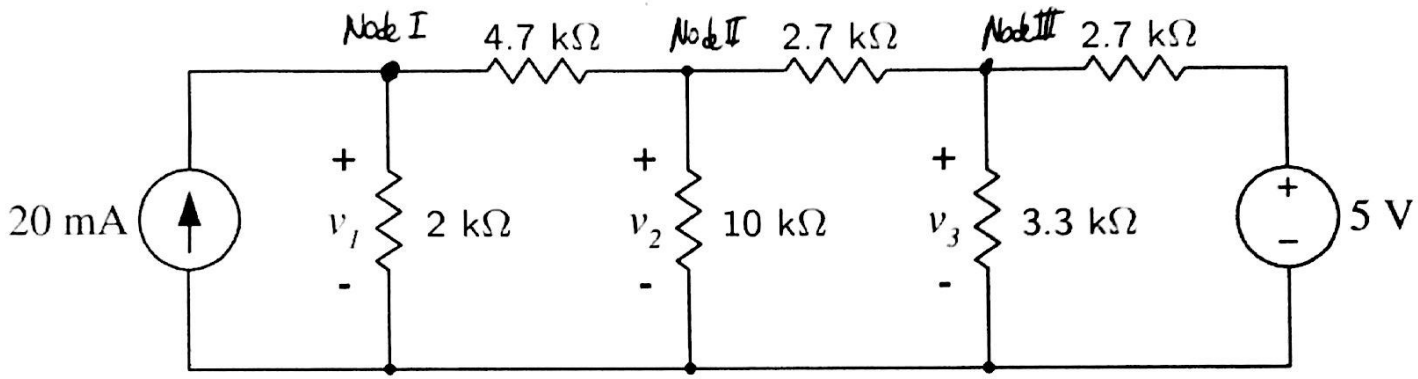
Example 4: Nodal Analysis



Solve for v_1, v_2, and v_3.

Node I) $-20m + \frac{V_1}{2k} + \frac{V_1 - V_2}{4.7k} = 0$ → $6.7V_1 - 2V_2 = 188$

Node II) $\frac{V_2 - V_1}{4.7k} + \frac{V_2}{10k} + \frac{V_2 - V_3}{2.7k} = 0$ → $-270V_1 + 866.9V_2 - 470V_3 = 0$

Node III) $\frac{V_3 - V_2}{2.7k} + \frac{V_3}{3.3k} + \frac{V_3 - 5}{2.7k} = 0$ → $-33V_2 + 93V_3 = 165$

$$A = \begin{bmatrix} 6.7 & -2 & 0 \\ -270 & 866.9 & -470 \\ 0 & -33 & 93 \end{bmatrix}$$

$$X = \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} \quad B = \begin{bmatrix} 188 \\ 0 \\ 165 \end{bmatrix}$$

$$X = A^{-1}B$$

$$\begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 32,1 \\ 13,6 \\ 6,6 \end{bmatrix}$$

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