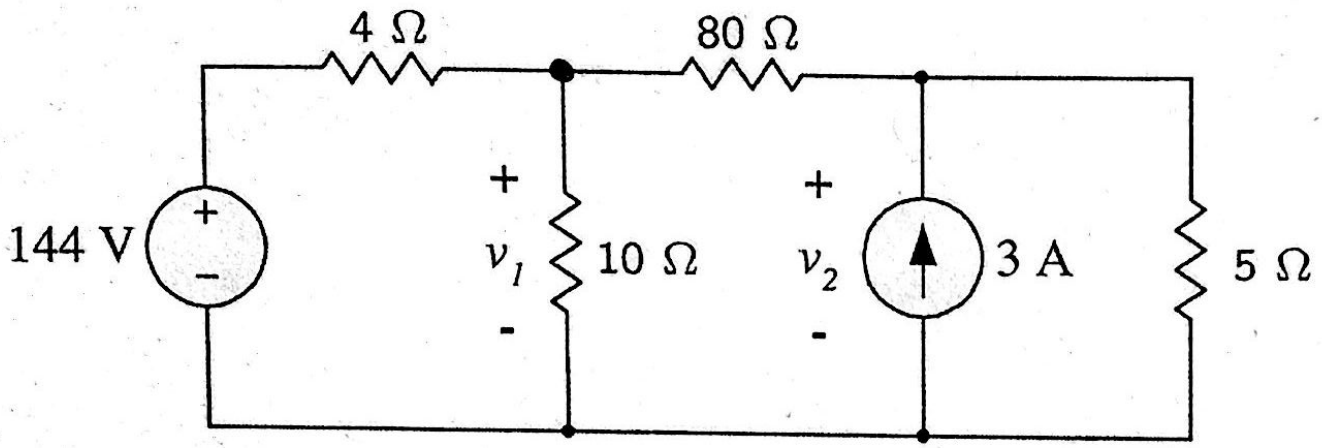
Example 3: Nodal Analysis



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)

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

$27V_1 - V_2 = 2880$

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

(80) (16)

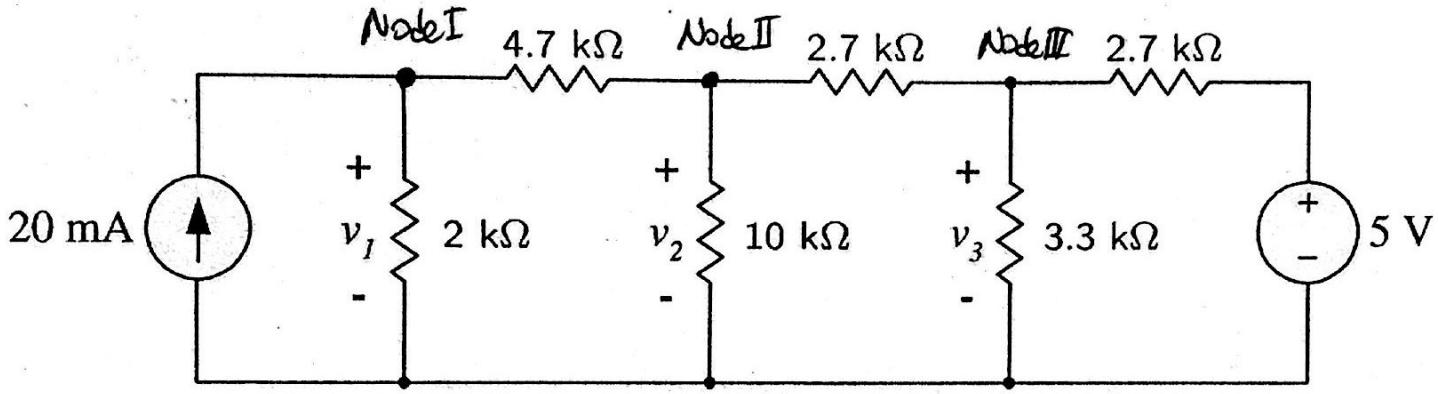
$V_2 - V_1 - 240 + 16V_2 = 0$

$17V_2 - V_1 = 240$

$V_1 = 107{,}4\ V$

$V_2 = 20{,}4\ V$

Example 4: Nodal Analysis



Solve for v_1, v_2, and v_3.

Node I) $-20m + \frac{v_1}{2k} + \frac{v_1 - v_2}{4.7k} = 0$

Node II) $\frac{v_2 - v_1}{4.7k} + \frac{v_2}{10k} + \frac{v_2 - v_3}{2.7k} = 0$

Node III) $\frac{v_3 - v_2}{2.7k} + \frac{v_3}{3.3k} + \frac{v_3 - 5}{2.7k} = 0$

$6.7V_1 - 2V_2 = 188$

$-2.7V_1 + 200.9V_2 - 47V_3 = 0$

$-33V_2 + 93V_3 = 165$

$$\begin{bmatrix} +6.7 & -2 & 0 \\ -2.7 & 200.9 & -47 \\ 0 & -33 & 93 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 188 \\ 0 \\ 165 \end{bmatrix}$$

A X B

$X = A^{-1}B$

$$\begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 29.5 \\ 4.77 \\ 3.47 \end{bmatrix}$$