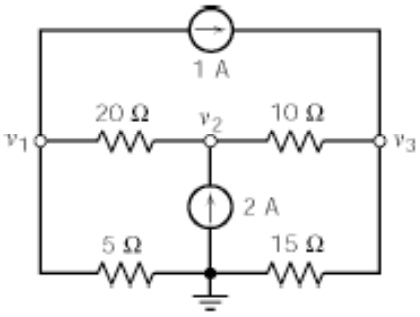
P4.3-2



KCL at node 1:

$$\frac{v_1 - v_2}{20} + \frac{v_1}{5} + 1 = 0 \quad \Rightarrow \quad 5v_1 - v_2 = -20$$

KCL at node 2:

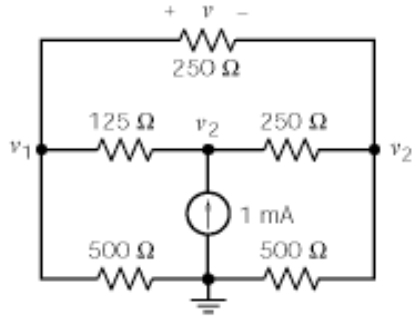
$$\frac{v_1 - v_2}{20} + 2 = \frac{v_2 - v_3}{10} \quad \Rightarrow \quad -v_1 + 3v_2 - 2v_3 = 40$$

KCL at node 3:

$$\frac{v_2 - v_3}{10} + 1 = \frac{v_3}{15} \quad \Rightarrow \quad -3v_2 + 5v_3 = 30$$

Solving gives $v_1 = 2$ V, $v_2 = 30$ V and $v_3 = 24$ V.

P4.3-5



Node equations:

$$\frac{v_1}{500} + \frac{v_1 - v_2}{125} + \frac{v_1 - v_3}{250} = 0$$

$$-\frac{v_1 - v_2}{125} - .001 + \frac{v_2 - v_3}{250} = 0$$

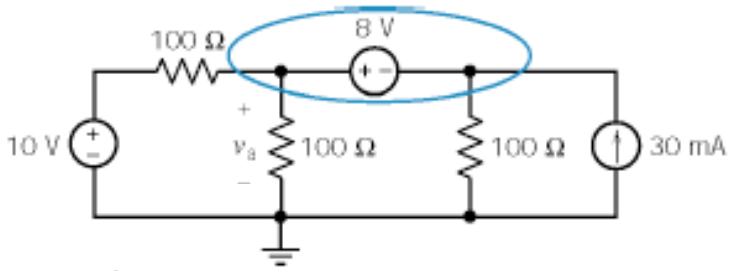
$$-\frac{v_2 - v_3}{250} - \frac{v_1 - v_3}{250} + \frac{v_3}{500} = 0$$

Solving gives:

$$v_1 = 0.261 \text{ V}, \quad v_2 = 0.337 \text{ V}, \quad v_3 = 0.239 \text{ V}$$

Finally, $v = v_1 - v_3 = \underline{0.022 \text{ V}}$

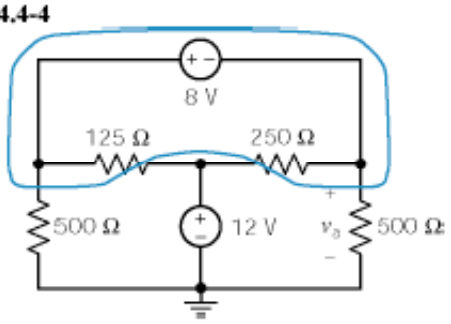
P4.4-3



Apply KCL to the supernode:

$$\frac{v_a - 10}{100} + \frac{v_a}{100} + \frac{v_a - 8}{100} - .03 = 0 \quad \Rightarrow \quad \underline{v_a = 7 \text{ V}}$$

P4.4-4



Apply KCL to the supernode:

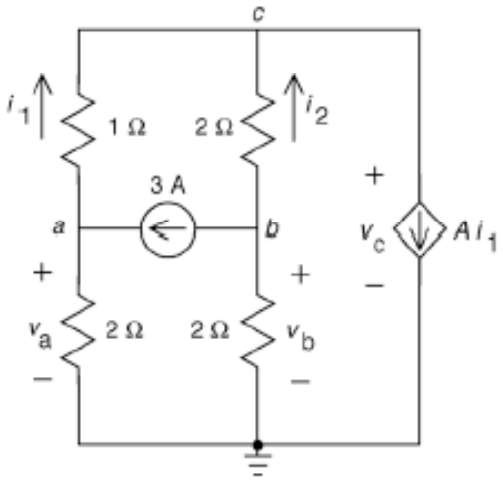
$$\frac{v_a+8}{500}+\frac{(v_a+8)-12}{125}+\frac{v_a-12}{250}+\frac{v_a}{500}=0$$

Solving yields

$$v_a = 4 \text{ V}$$

(checked using LNAP 8/13/02)

P4.5-1



Express the resistor currents in terms of the node voltages:

$$i_1=\frac{v_a-v_c}{1}=8.667-10=-1.333 \text{ A and}$$

$$i_2=\frac{v_b-v_c}{2}=\frac{2-10}{2}=-4 \text{ A}$$

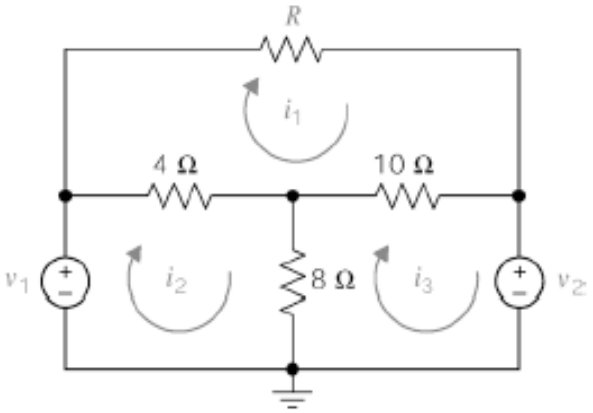
Apply KCL at node *c*:

$$i_1+i_2=A\,i_1 \quad \Rightarrow \quad -1.333+(-4)=A\,(-1.333)$$

$$\Rightarrow \quad A=\frac{-5.333}{-1.333}=4$$

(checked using LNAP 8/13/02)

P 4.6-2



Top mesh:

$$4\,(2-3)+R(2)+10(2-4)=0$$

so R = 12 Ω.

Bottom, right mesh:

$$8\,(4-3)+10\,(4-2)+v_2=0$$

so v_2 = –28 V.

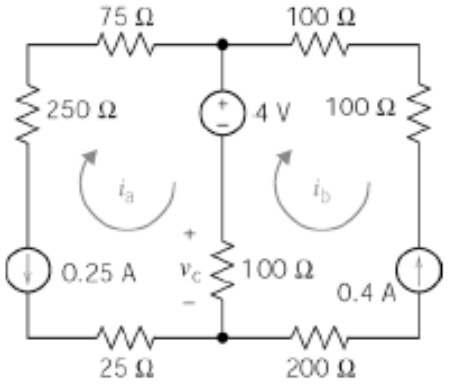
Bottom left mesh

$$-v_1+4\,(3-2)+8\,(3-4)=0$$

so v_1 = –4 V.

(checked using LNAP 8/14/02)

P4.7-2



mesh a: $i_a = -0.25$ A

mesh b: $i_b = -0.4$ A

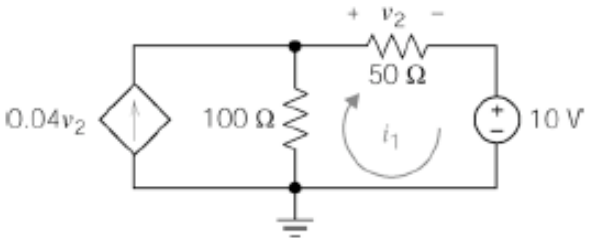
$v_c = 100(i_a - i_b) = 100(0.15) = \underline{15\text{ V}}$

(checked using LNAP 8/14/02)

P 4.7-8

Express the controlling voltage of the dependent source as a function of the mesh current

$$v_2 = 50\, i_1$$



Apply KVL to the right mesh:

$$-100\,(0.04(50i_1) - i_1) + 50i_1 + 10 = 0 \Rightarrow i_1 = 0.2\text{ A}$$

$$v_2 = 50\, i_1 = 10\text{ V}$$

(checked using LNAP 8/14/02)