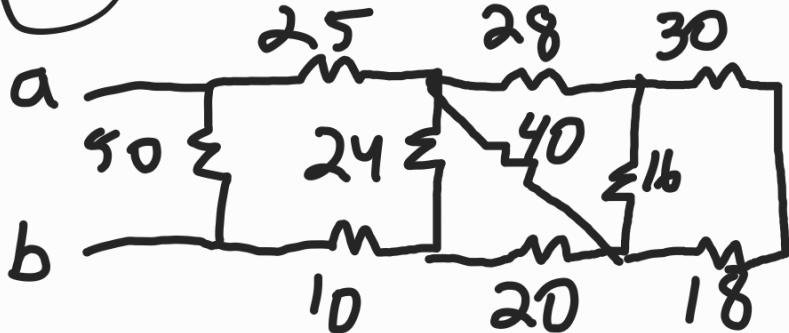


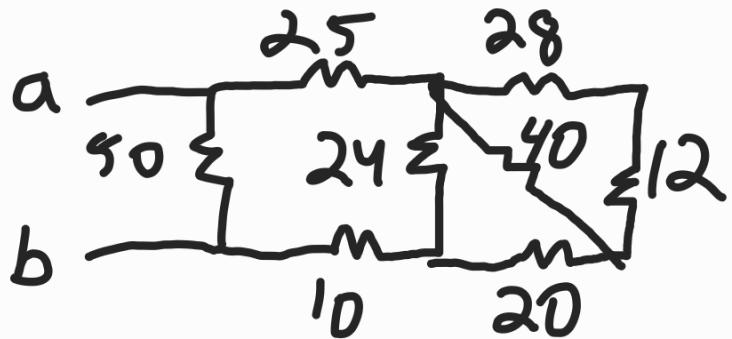
Homework 2

Assignment 1

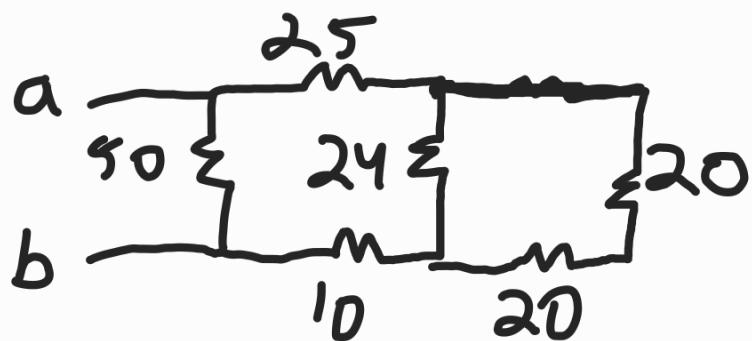
#1 60Ω shorts and is ignored



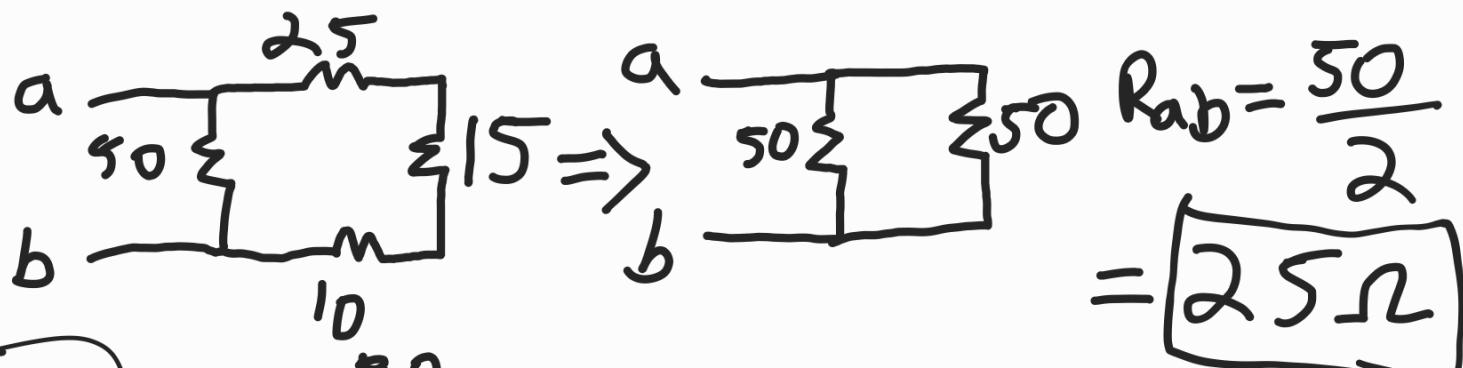
$$\frac{30 + 18 = 48}{48 \cdot 16 = 64} = 12\Omega$$



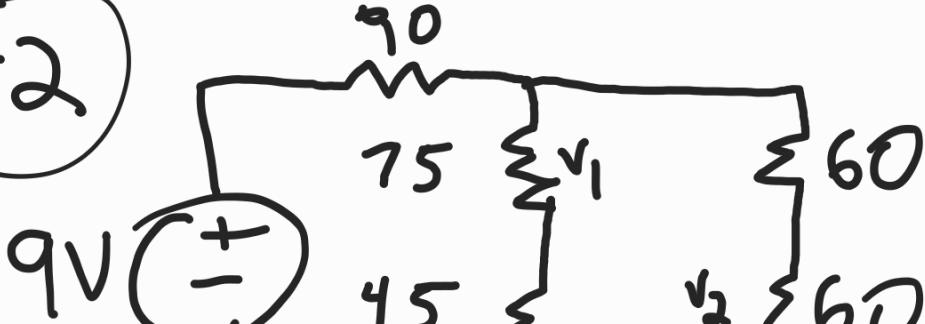
$$\frac{28 + 12 = 40}{40 \cdot 40 = 80} = 20\Omega$$



$$\frac{20 + 20 = 40}{40 \cdot 24 = 64} = 15\Omega$$



#2



$$75 + 45 = 120$$

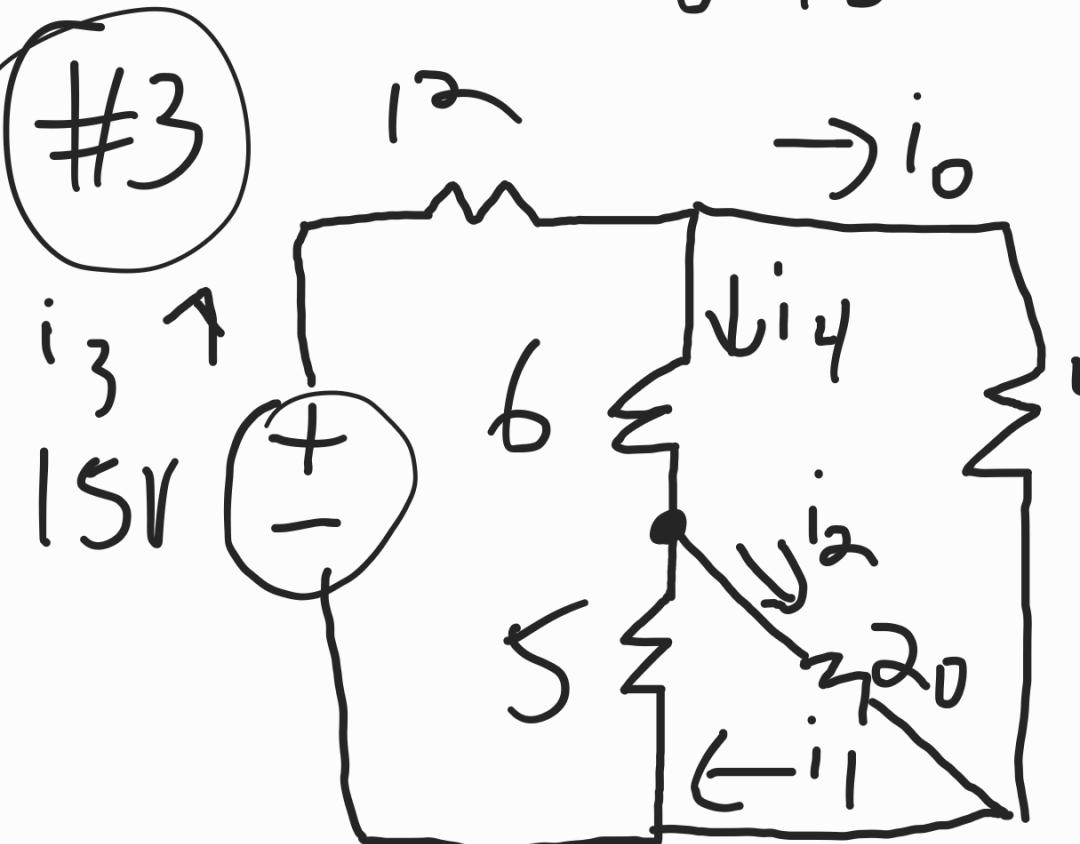
$$60 + 60 = 120$$

$9V$ 60Ω $V_o = \frac{9 \cdot 60}{60 + 90}$

$V_o = 3.6V$

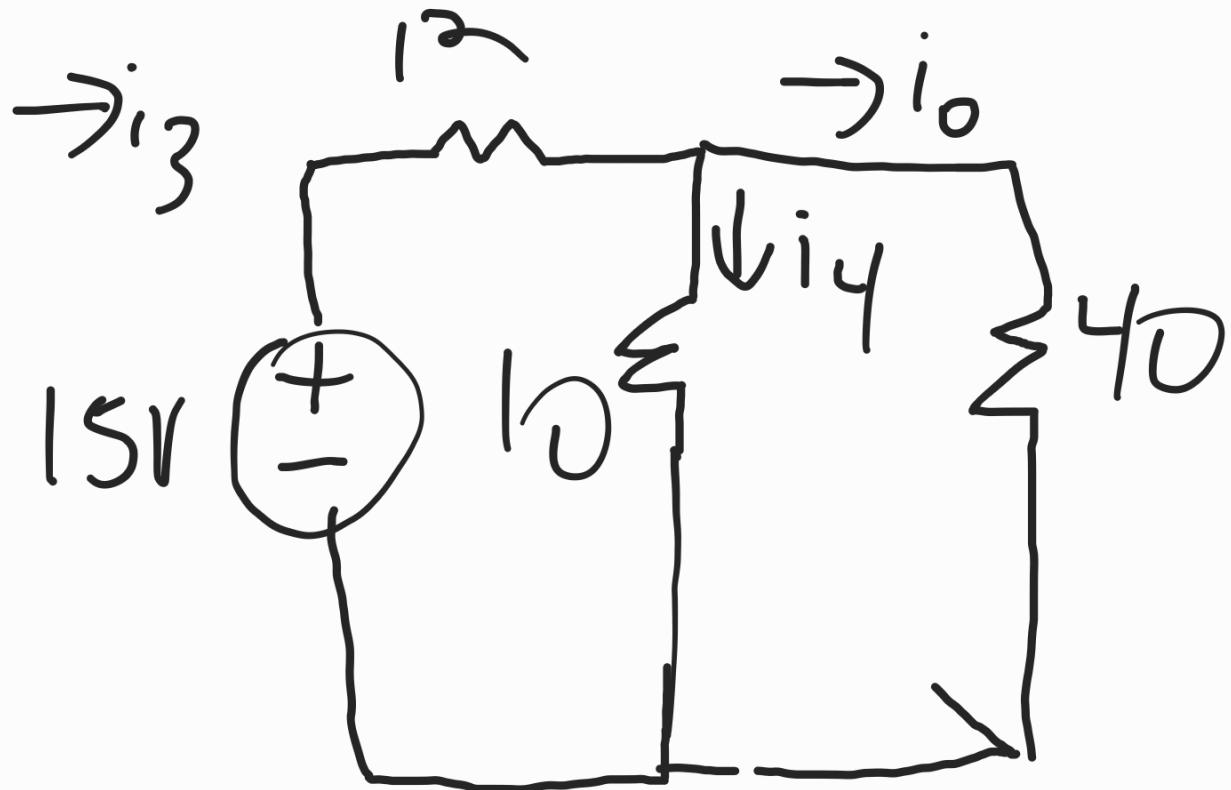
$V_1 = 3.6 \cdot \frac{75}{75 + 45} = 2.25V$

$V_2 = 3.6 \cdot \frac{60}{60 + 60} = 1.8V$

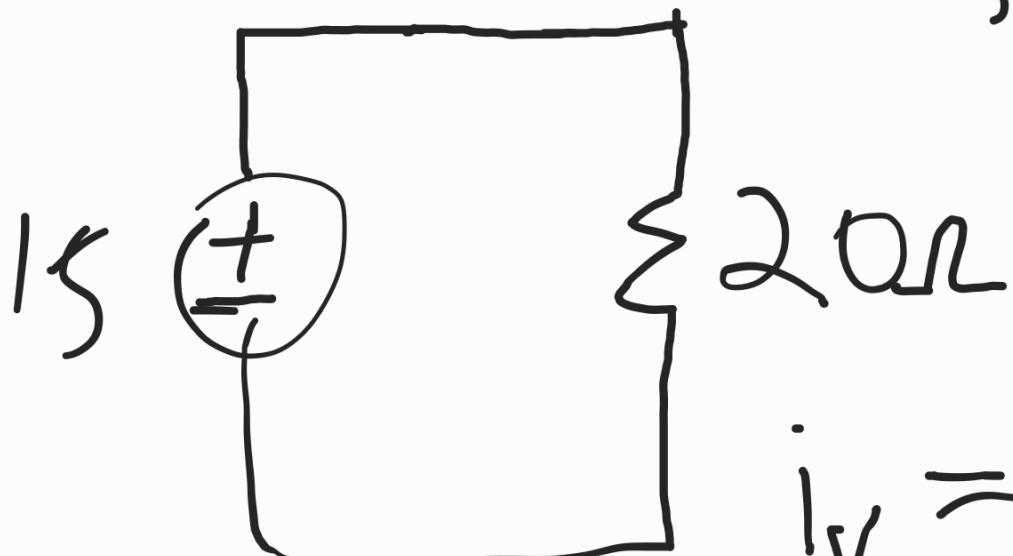


$\frac{20 \cdot 5}{20 + 5} = 4\Omega$

25



$$\frac{40 \cdot 10}{50} = 8\Omega$$



$$i_V = \frac{15}{20}$$

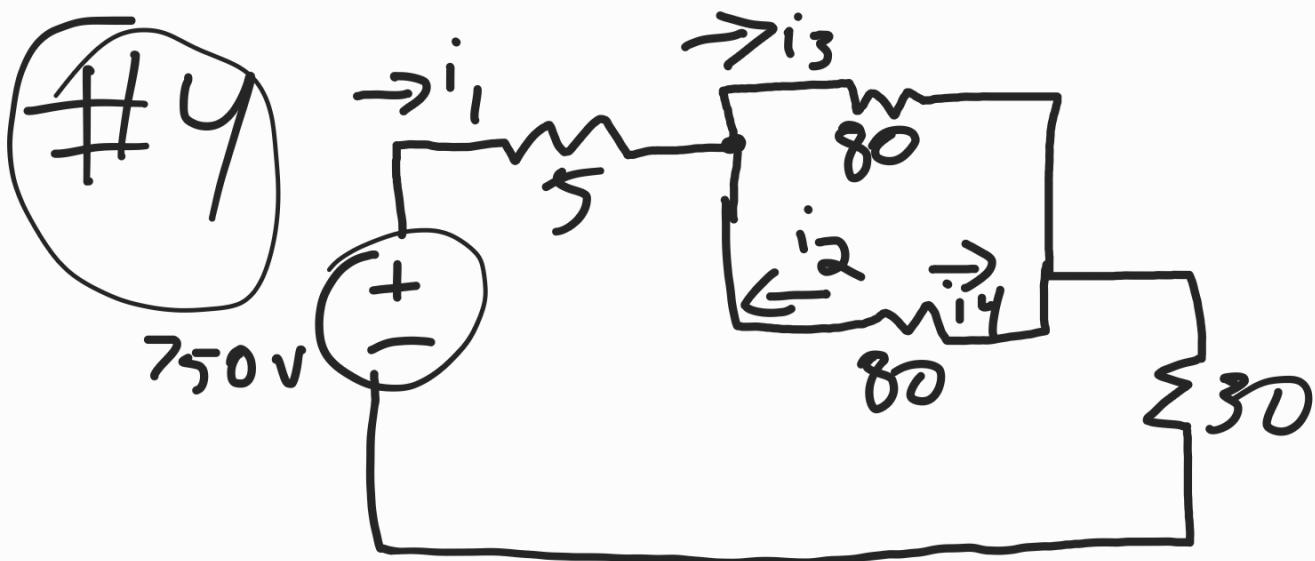
$$i_V = .75 \text{ A}$$

$$i_0 = .75 \cdot \frac{10}{50} = .15 \text{ A}$$

$$i_4 = .75 \cdot \frac{40}{50} = .6 \text{ A}$$

$$i_2 = .6 \cdot \frac{5}{25} = .12 \text{ A}$$

$$i_1 = i_0 + i_2 = .27 \text{ A}$$





$$a) i_1 = \frac{750}{75} = 10 \text{ A}$$

$$i_3 = 10 \cdot \frac{80}{160} = 5 \text{ A}$$

$$i_4 = 10 \cdot \frac{80}{160} = 5 \text{ A}$$

$$i_2 = -i_4 = -5 \text{ A}$$

$$V = -i_3 \times 20 = -100 \text{ V}$$

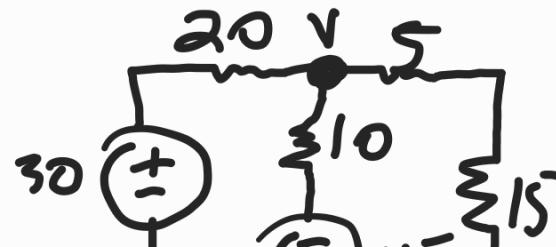
$$P_{\text{del}} = 750 \times 10 = 7500 \text{ W}$$

$$P_{\text{abs}} = i_1^2 \times 30 = 3000 \text{ W}$$

Assignment 2

#1

$$i_1 + i_2 + i_3 = 0$$



$$\text{#1} \quad i_a + i_b + i_c = 0$$

745

$$\frac{V - 30}{20} + \frac{V + 45}{10} + \frac{V}{20} = 0$$

$$\frac{V}{20} - \frac{30}{20} + \frac{V}{10} + \frac{45}{10} + \frac{V}{20} = 0$$

$$\frac{V}{5} = -3$$

$$V = -15 \text{ V}$$

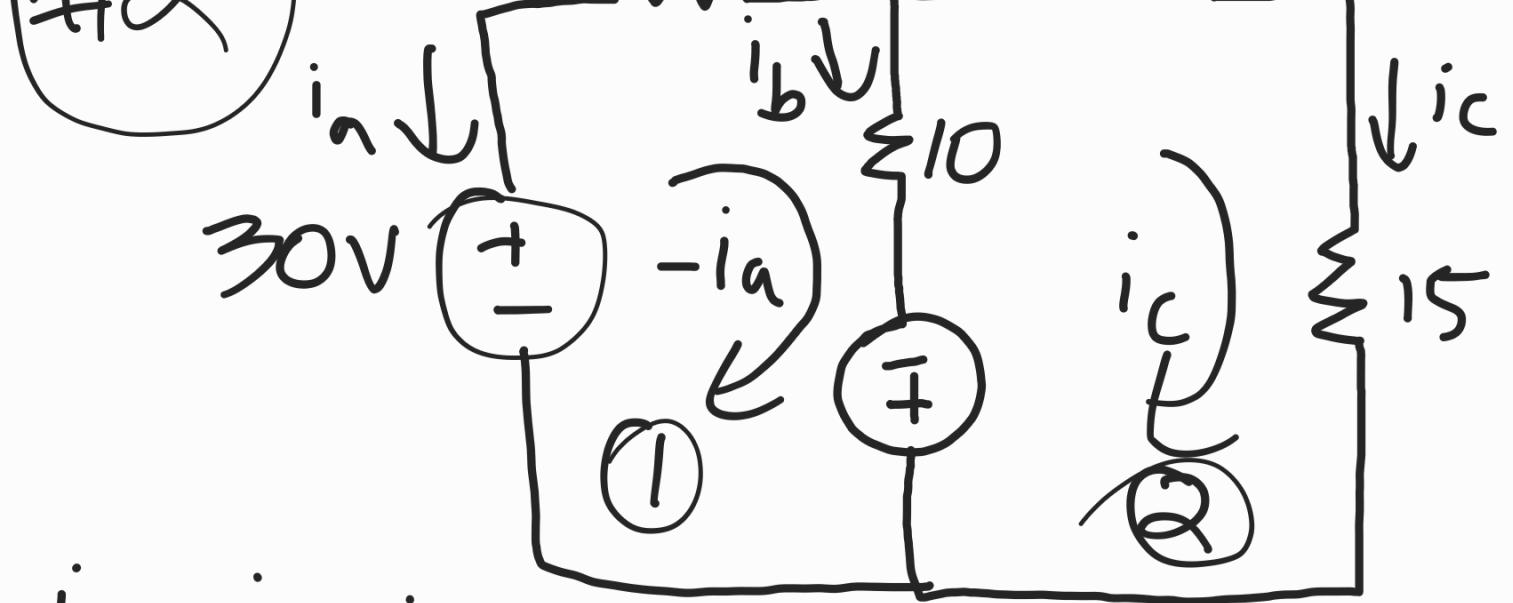
$$i_a = \frac{V - 30}{20} = -2.25 \text{ A}$$

$$i_b = \frac{V + 45}{10} = 3 \text{ A}$$

$$i_c = \frac{V}{20} = -0.75 \text{ A} \quad P_{abs} = 67.5 \text{ W}$$

$$P_{30V} = V \times i_a = 67.5 \text{ W} = P_{del}$$





$$i_a + i_b + i_c = 0$$

$$i_b = -i_a - i_c$$

$$\textcircled{1} \quad -30 - 20i_a + 10(-i_a - i_c) - 45 = 0$$

$$-30 - 20i_a - 10i_a - 10i_c - 45 = 0$$

$$-30i_a - 10i_c - 75 = 0$$

$$6i_a + 2i_c + 15 = 0$$

$$\textcircled{2} \quad 20i_c + 45 + 10(i_c + i_a) = 0$$

$$30i_c + 10i_a + 45 = 0$$

$$6i_c + 2i_a + 9 = 0$$

$$i_C = -\frac{9 - 2i_a}{6} \quad * \text{ plug into } ①$$

$$6i_a + \frac{-9 - 2i_a}{3} + 15 = 0$$

$$18i_a - 9 - 2i_a + 45 = 0$$

$$16i_a = -36$$

$$i_a = -2.25A$$

$$i_C = -\frac{9 - 2(-2.25)}{6} = -7.5A$$

$$i_b = (2.25 + .75) = 3 \text{ A}$$

$$\begin{aligned}P_{\text{abs}} &= 30, -2.25 \\&= -67.5 \text{ W}\end{aligned}$$

$$P_{\text{dd}} = 67.5 \text{ W}$$

* Mesh-Current Method
uses Kirchhoff voltage law
to calculate current so
it would be better for this
particular

Fundamental problem.

#3

$$\frac{V_1}{2} + \underbrace{\frac{V_1 - V_2}{5}}_{S} + 2i_x = 5$$

$$i_x = \frac{V_1}{2}$$

V_1 node

$$\frac{V_1}{2} + \underbrace{\frac{V_1 - V_2}{5}}_{S} + V_1 = 5$$

$$\frac{V_1}{2} + \frac{V_1}{5} - \frac{V_2}{5} + V_1 = 5$$

$$\underbrace{\frac{17V_1}{10} - \frac{V_2}{5}}_{S} = 5$$

V_2 node

2 node

$$\frac{V_2 + V_2 - V_1}{5} - 2i_x + 2 = 0$$

$$i_x = V_1/2$$

$$\frac{V_2 + V_2 - V_1}{5} - V_1 + 2 = 0$$

$$\frac{V_2 + V_2}{5} - \frac{V_1}{5} - V_1 + 2 = 0$$

$$(V_2 + V_2) - V_1 - 5V_1 + 10 = 0$$

$$\frac{6V_2}{5} - \frac{6V_1}{5} = -2$$

$$\frac{6V_2}{5} = \frac{6V_1}{5} - 2$$

$$V_2 = V_1 - \frac{5}{3}$$

** plug into
1st equation*

$$\frac{17V_1}{10} - \frac{V_1 - 5/3}{5} = 5$$

$$\frac{17V_1}{10} - \frac{2V_1 - 10/3}{10} = 5$$

$$\frac{15V_1 + 10/3}{10} = 5$$

10

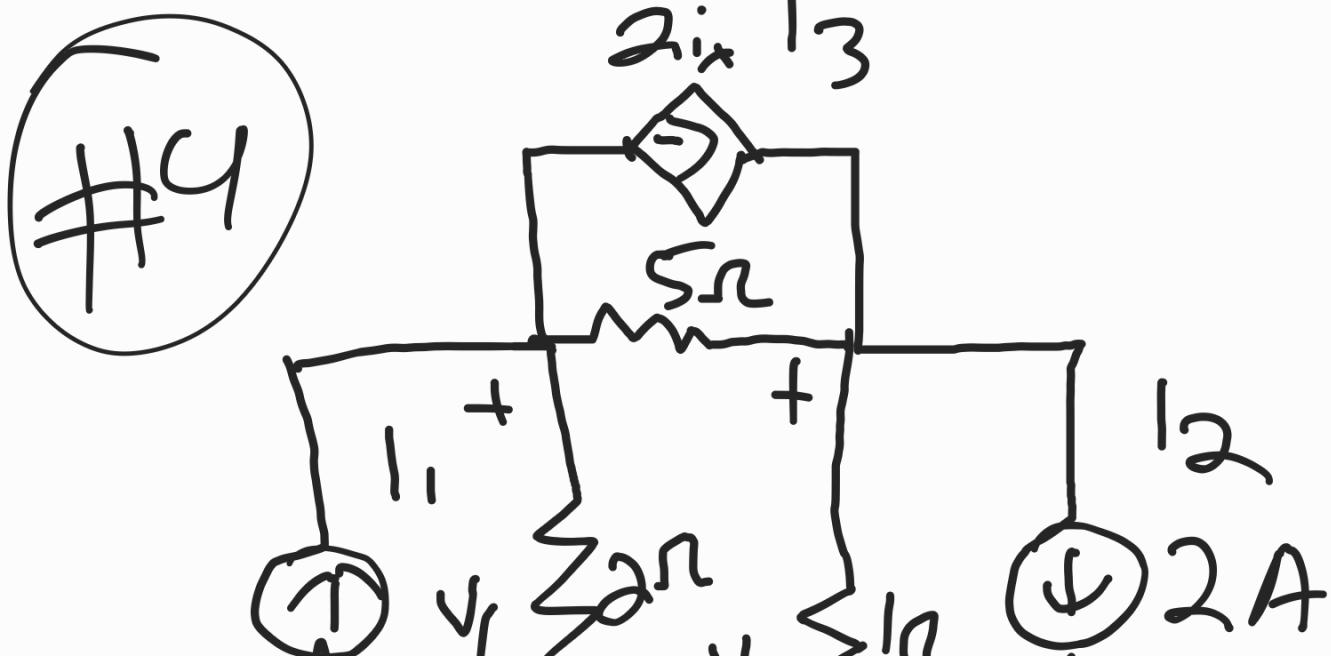
$$15V_1 + 10/3 = 50$$

$$V_1 = 3.11 \text{ V}$$

$$V_2 = 3.11 - 5/3 = 1.44 \text{ V}$$

$$P_{\text{del}} = V_2 \cdot 2 = 2.88 \text{ W}$$

$$P_{\text{abs}} = -2.88 \text{ W}$$





$$\textcircled{1} \quad I_1 = 2ix \quad ix = I_2 - I_3$$

$$\textcircled{2} \quad I_2 = SA$$

$$\textcircled{3} \quad 8I_3 - 2 \cdot 5 - 2 - 5 \cdot 2ix = 0$$

$$8I_3 - 2 \cdot 5 - 2 - 5 \cdot 2(5 - I_3) = 0$$

$$8I_3 + 10I_3 = 62$$

$$I_3 = 3.44 \text{ A}$$

$$V_2 = I(3.44 - 2) = 1.44 \text{ V}$$

$$V_1 = 2(3.44 - 5) = 3.11V$$

$$P_{del} = V_2 \cdot 2 = 2.88W$$

$$P_{abs} = -2.88W$$

