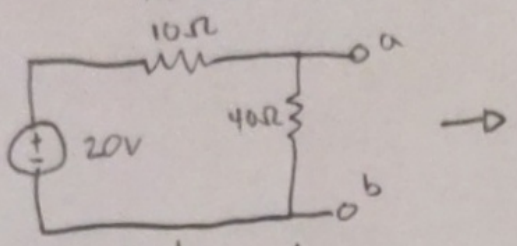
Chris Hunt

Homework 7

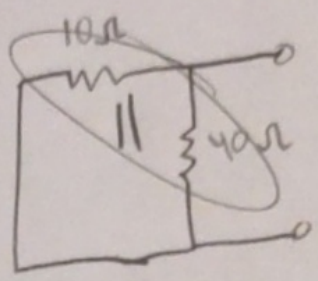
ENGR 201

7.1) Find R_{TH} and V_{TH}

a)



R_{TH})

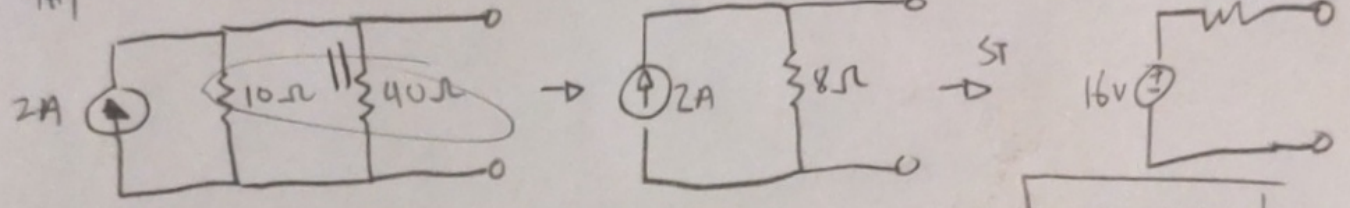


$R_{TH} = \frac{10\Omega \cdot 40\Omega}{50\Omega}$

$R_{TH} = 8\Omega$

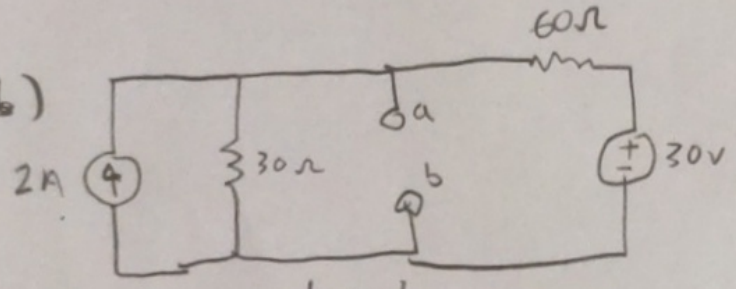
ST!

V_{TH})

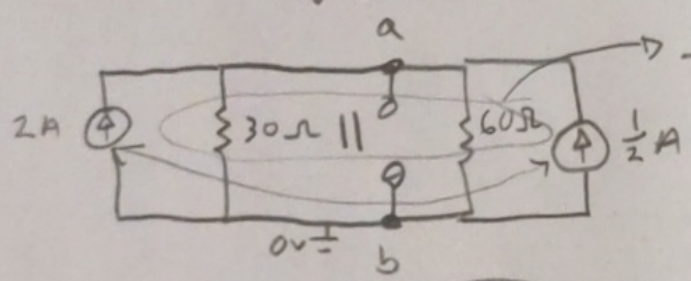


$V_{TH} = 16V$

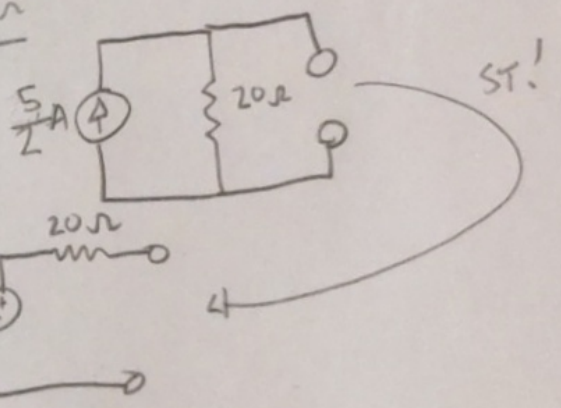
b)



ST!



$\frac{30 \cdot 60\Omega}{90\Omega}$



$R_{TH} = 20\Omega$

$V_{TH} = 50V$

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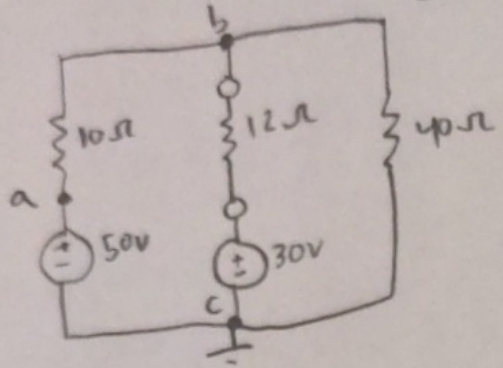
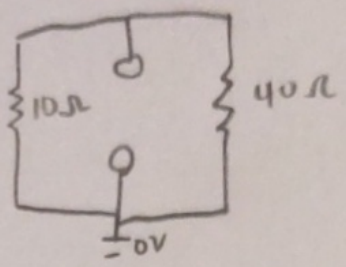
7.2) Solve for I using Thevenin equivalent as seen by the 12Ω resist



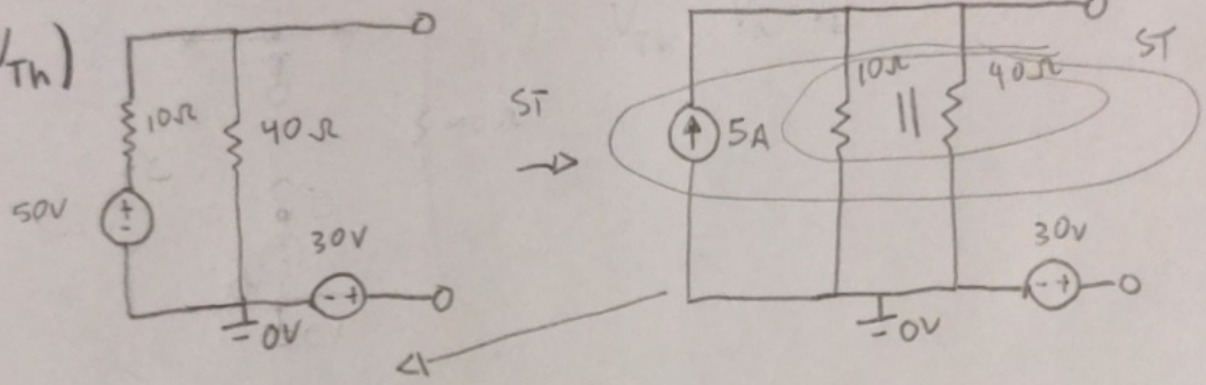
R_{Th})

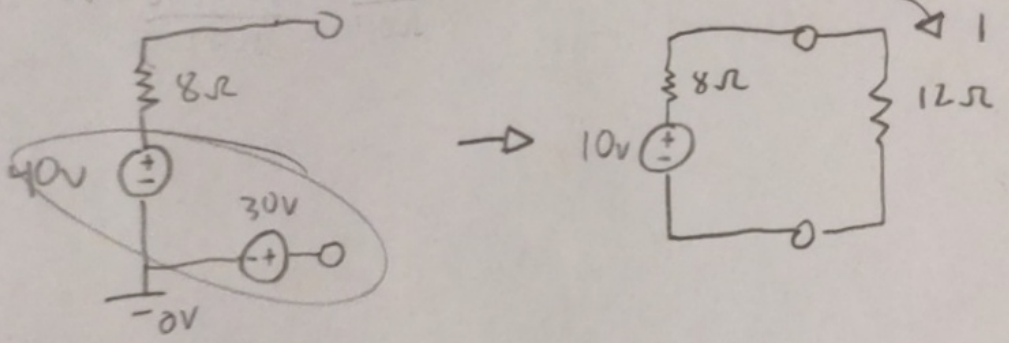


$R_{Th} = \frac{400\Omega}{50\Omega}$

$R_{Th} = 8\Omega$

V_{Th})





$i = \frac{10V}{8\Omega + 12\Omega}$

$i = .5\ A$

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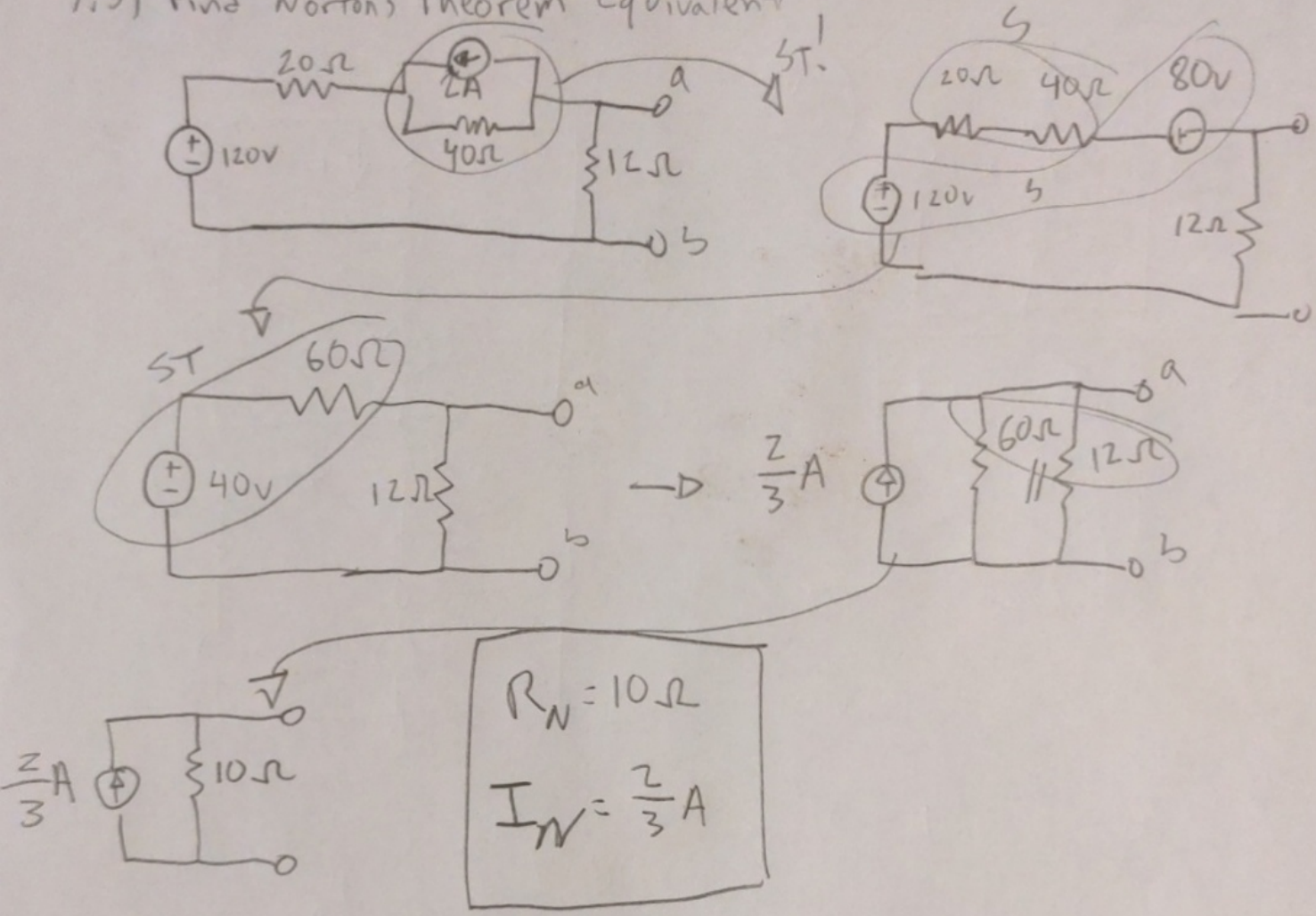
7.31) Find Norton's Theorem Equivalent



$R_N = 10\,\Omega$

$I_N = \frac{2}{3}\,A$

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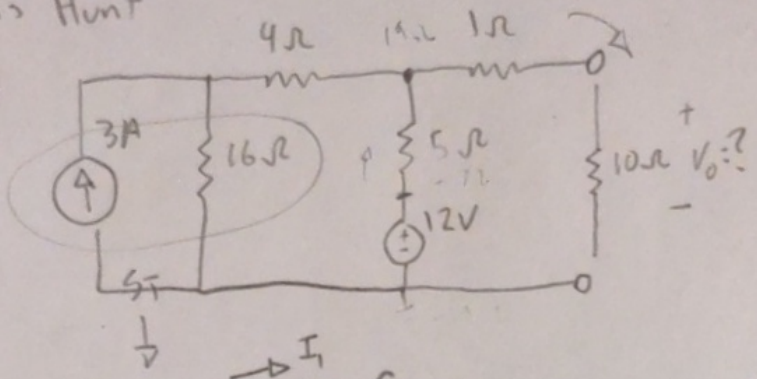
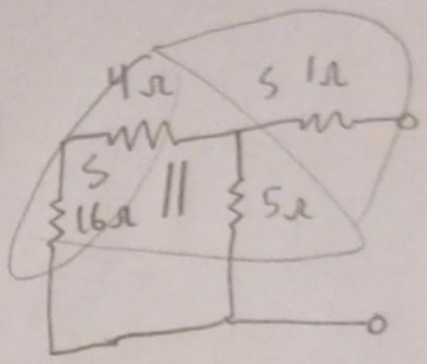
7.4)



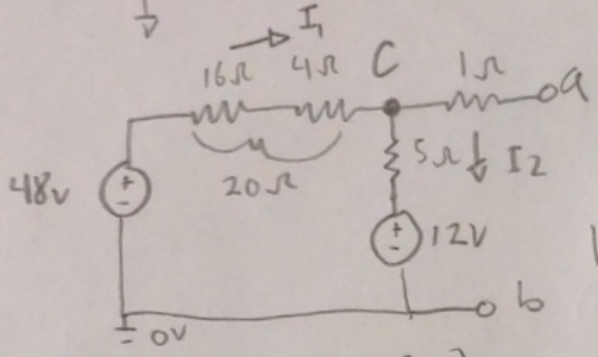
R_{TH})



$R_{TH} = ((16\Omega \cdot 4\Omega) \parallel 5\Omega) + 1\Omega$

$\boxed{R_{TH} = 5\Omega}$

V_{TH})

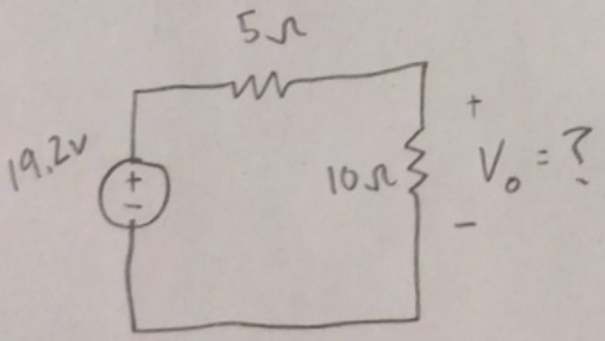


$V_c = V_a = V_{TH}$

node c) $\left(\frac{48V - V_c}{20\Omega} = \frac{V_c - 12V}{5\Omega}\right) 20\Omega$

$48V - V_c = 4V_c - 48$

$96V = 5V_c \rightarrow V_c = \boxed{19.2V = V_{TH}}$



$V_o = 19.2V\left(\frac{10\Omega}{15\Omega}\right)$

$\boxed{V_o = 12.8V}$

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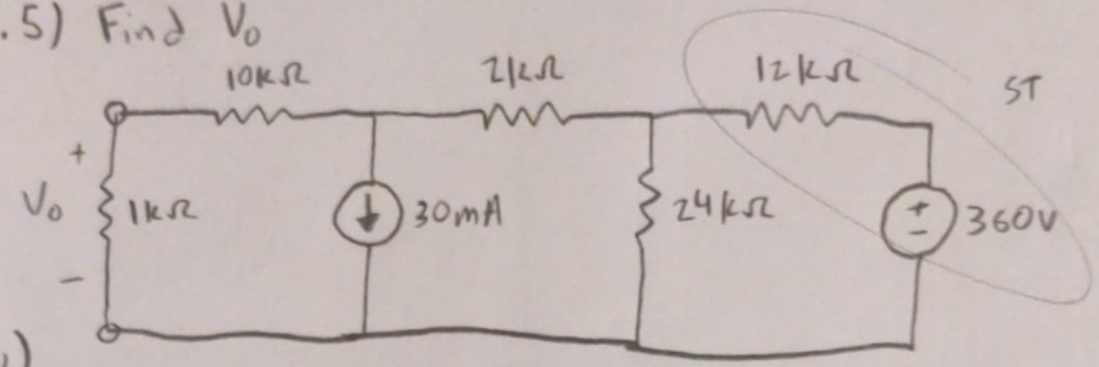
7.5) Find V_o

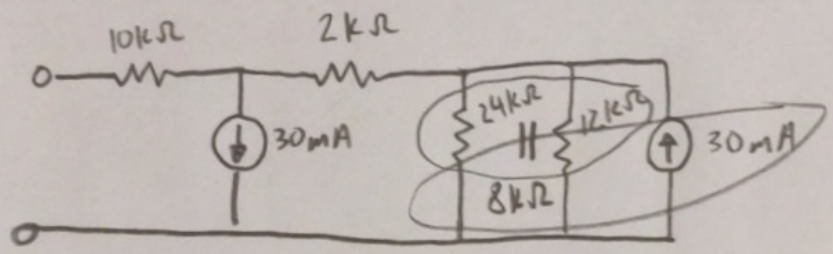


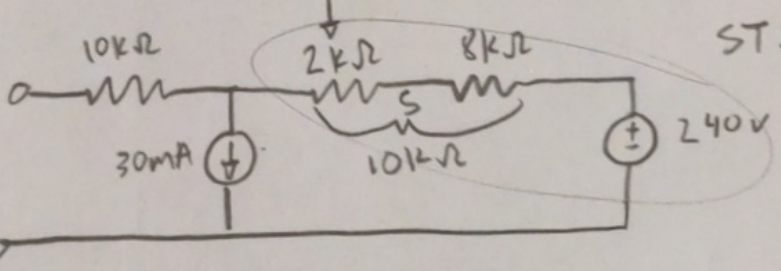
R_N)

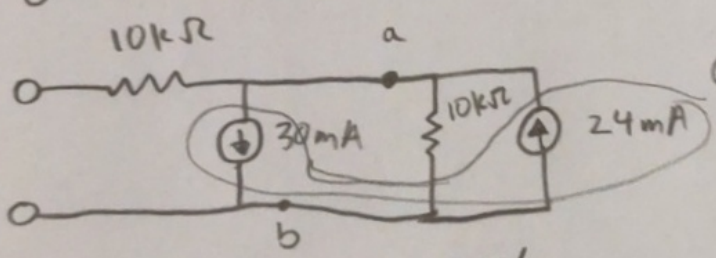
$R_N = \left((12k\Omega \,||\, 24k\Omega) + 2k\Omega + 10k\Omega \right)$

$R_N = 20k\,\Omega$

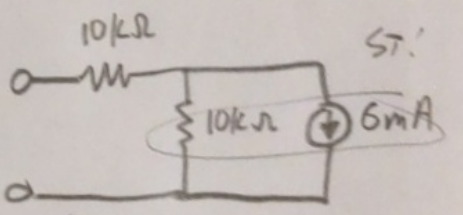
I_N)

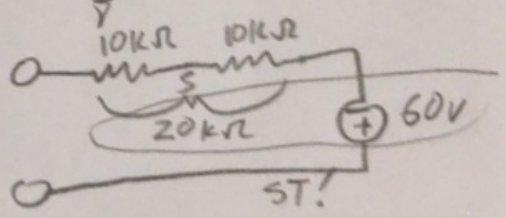


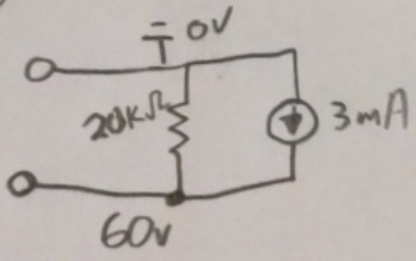




combine!







$I_N = 3mA$

$V_o = -60v$

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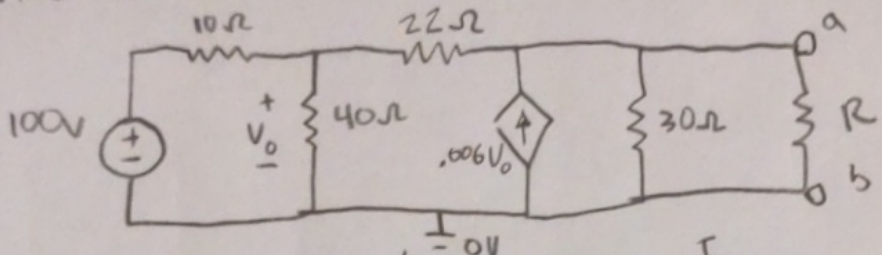
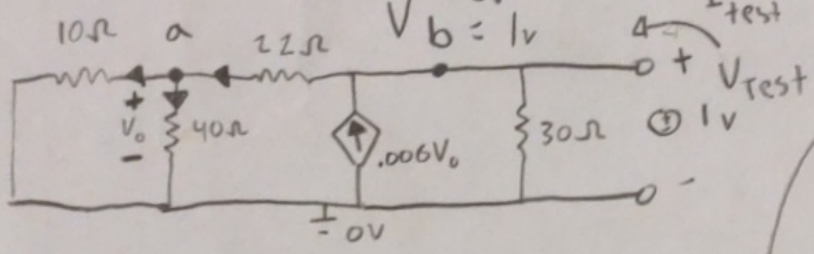
7.6) Find the maximum power transferred to the Resistor R



$$P_{max} = \frac{V_{TH}^2}{4R_{TH}}$$

R_{Th})



$$R_{Th} = \frac{V_{Test}}{I_{test}}$$

$$R_{Th} = \frac{1v}{.04417A}$$

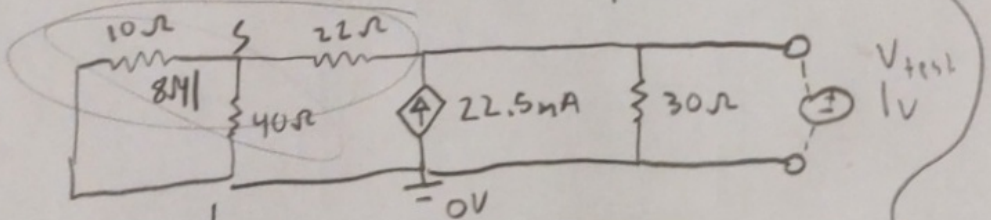
$$\boxed{R_{TH} = 22.64\Omega}$$

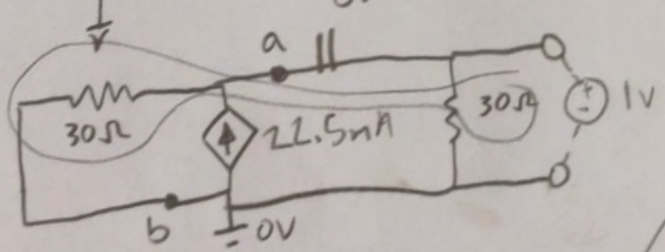
node a) $\left(\frac{1v - V_a}{22\Omega} = \frac{V_a}{10\Omega} + \frac{V_a}{40\Omega}\right) 880\Omega$

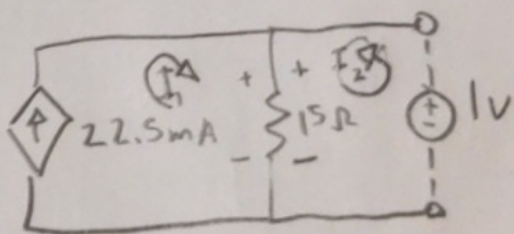
$40v - 40V_a = 88V_a + 22V_a$

$+40V_a$

$40v = 150V_a \rightarrow V_a = \frac{15}{4}v = V_o$







mesh I_1) $i_1 = 22.5mA$

Mesh I_2) $(1v + 15\Omega(i_2 + i_1) = 0)\frac{1}{1\Omega}$

$-1A + 15i_2 + 337.5mA = 0$

$15I_2 = 662.5mA$

$$\boxed{I_2 = 44.17mA}$$

V_{Th} on next page

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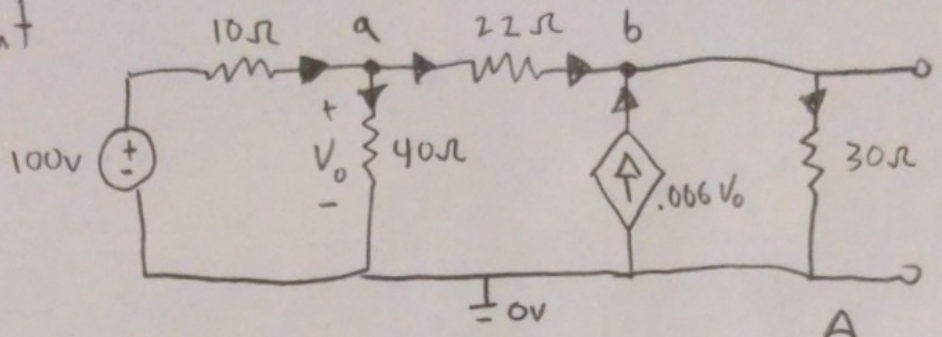
7.6) V_{Th})



$V_b = V_{Th}$

@ a) $\left(\frac{100v - V_a}{10\Omega} = \frac{V_a}{40\Omega} + \frac{V_a - V_b}{22\Omega}\right) 880\Omega$

$8800v - 88V_a = 22V_a + 40V_a - 40V_b$

$+88V_a$

$150V_a - 40V_b = 8800v$

@ b) $\left(\frac{V_b - V_a}{22\Omega} + .006V_a = \frac{V_b}{30\Omega}\right) 660\Omega$

$30V_b - 30V_a + 3.96V_a = 22V_b$

$-26.04V_a + 8V_b = 0$

$$\begin{matrix} A & & x & & b \end{matrix}$$

$$\begin{bmatrix} 150 & -40 \\ -26.04 & 8 \end{bmatrix} \begin{bmatrix} V_a \\ V_b \end{bmatrix} = \begin{bmatrix} 8800 \\ 0 \end{bmatrix}$$

$A^{-1}b = X$

something happens at this point that I can't solve.

found through LTspice

$V_{Th} = 46.39\,v \qquad R_{Th} = 22.64\,\Omega$

$$P_{max} = \frac{V_{Th}^2}{4R_{Th}} \rightarrow P_{max} = 23.76\,w$$