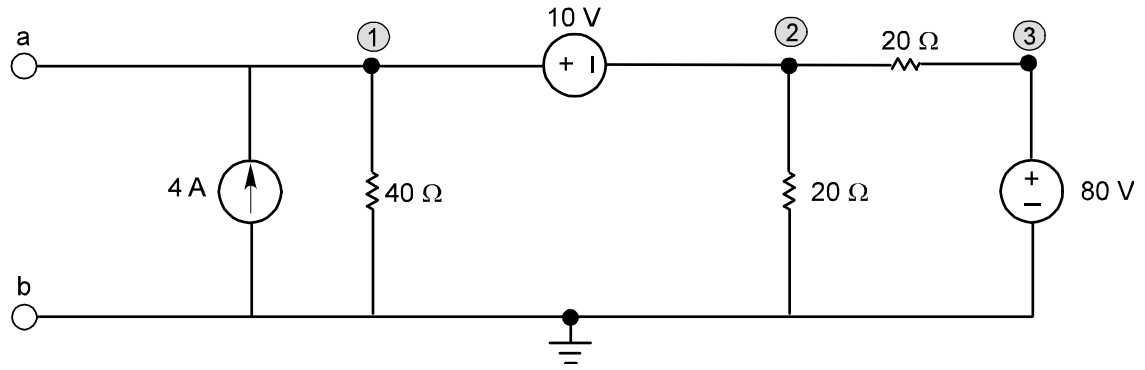
Homework Set #13
DUE Friday, April 3, 2017

1. For the circuit shown below:



a) Write and solve the nodal equation needed to determine V_1.

b) De-activate the sources and determine the resistance seen by terminals a—b, when they are open-circuited.

c) Draw the Thevenin Equivalent at terminals a—b.
(NOTE: you can use source transforms to check this result.)

$V_2 = V_1 - 10$ and $V_3 = 80$

$$-4 + \frac{V_1}{40} + \frac{V_2}{20} + \frac{V_2 - 80}{20} = 0$$

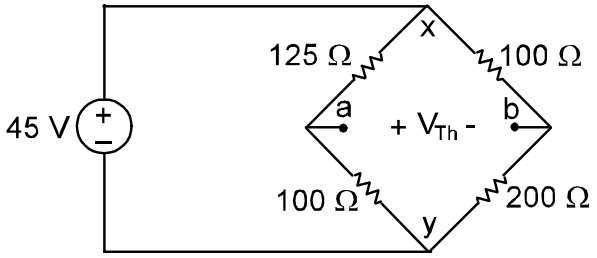
$$-4 + \frac{V_1}{40} + \frac{V_1 - 10}{20} + \frac{V_1 - 90}{20} = 0$$

$0.125V_1 = 9$

This solves to: $V_1 = 72\ V = V_{Th}$

$R_{Th} = 40//20//20 = 8\ \Omega$

2. Determine the Thevenin equivalent circuit across terminals a—b for the Wheatstone Bridge shown below:



(NOTE: When you de-activate the 45 V source x & y become the same node, so some resistors are in parallel when you look into a-b.)

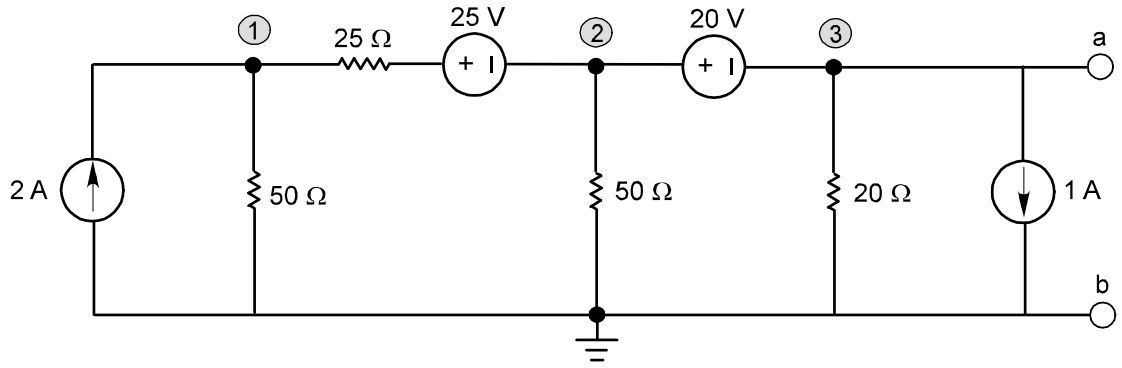
With a—b on O/C, V_{Th} is the difference of two voltage dividers.

$$V_a = 45 \text{ x } \frac{100}{125 + 100} = 20 \text{ V} \qquad \text{and} \qquad V_b = 45 \text{ x } \frac{200}{200 + 100} = 30 \text{ V}$$

$$V_{Th} = V_a - V_b = \boxed{-10 \text{ V}}$$

With the 45V source de-activated R_{Th} = (125//100) + (200//100) = $\boxed{122.2\ \Omega}$

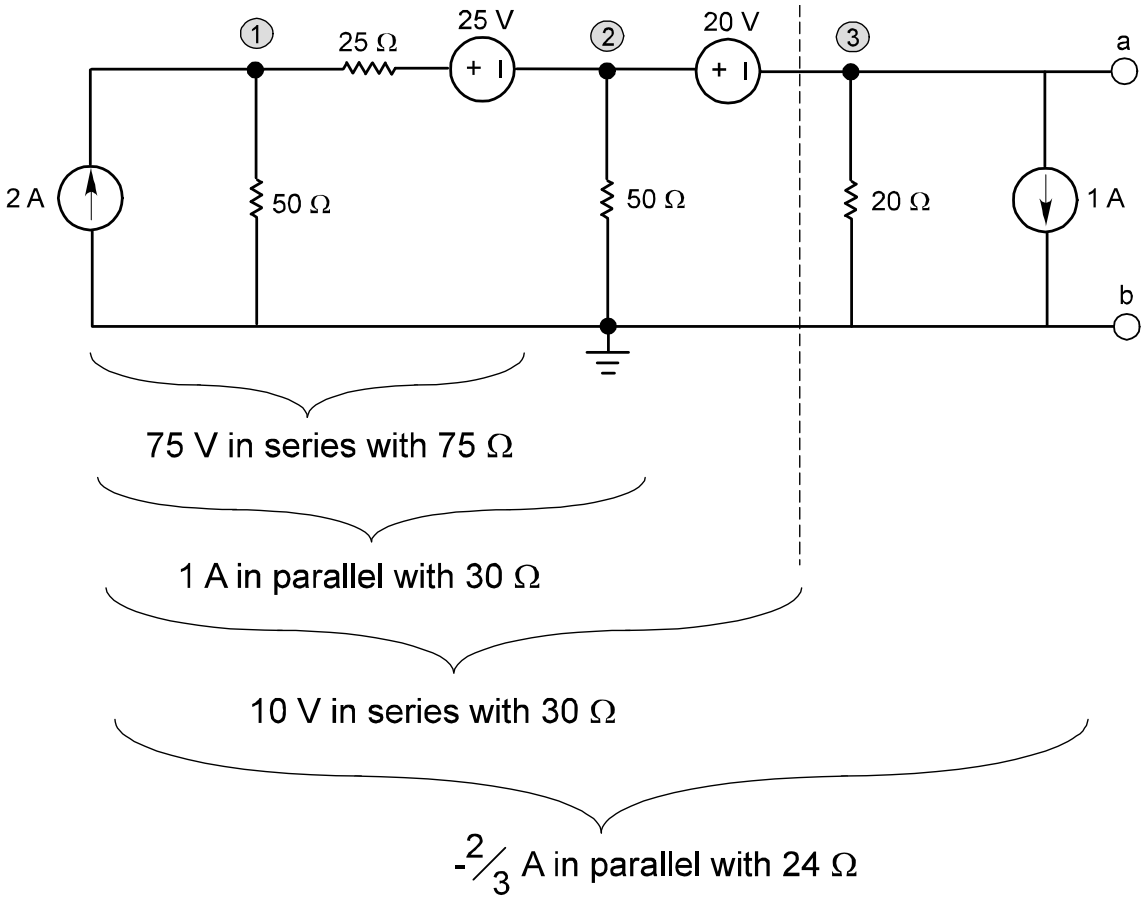
3. For the circuit shown below:



a) Use source transforms to determine the Thevenin Equivalent at terminals a—b. (i.e. Draw the Thevenin Equivalent looking into terminals a—b.)

b) Assume the answer to part (a) is V_{Th} = 12 V and R_{Th} = 8 Ω (NOTE: this is ***not*** the answer to part (a)) and determine the power dissipated in a 127.5 Ω load resistor connected across a—b.

a)



$$I_L = \frac{12}{127.5 + 8} = 88.6\ mA \qquad and \qquad P_L = 0.0886^2\ x\ 127.5 = 1\,W$$