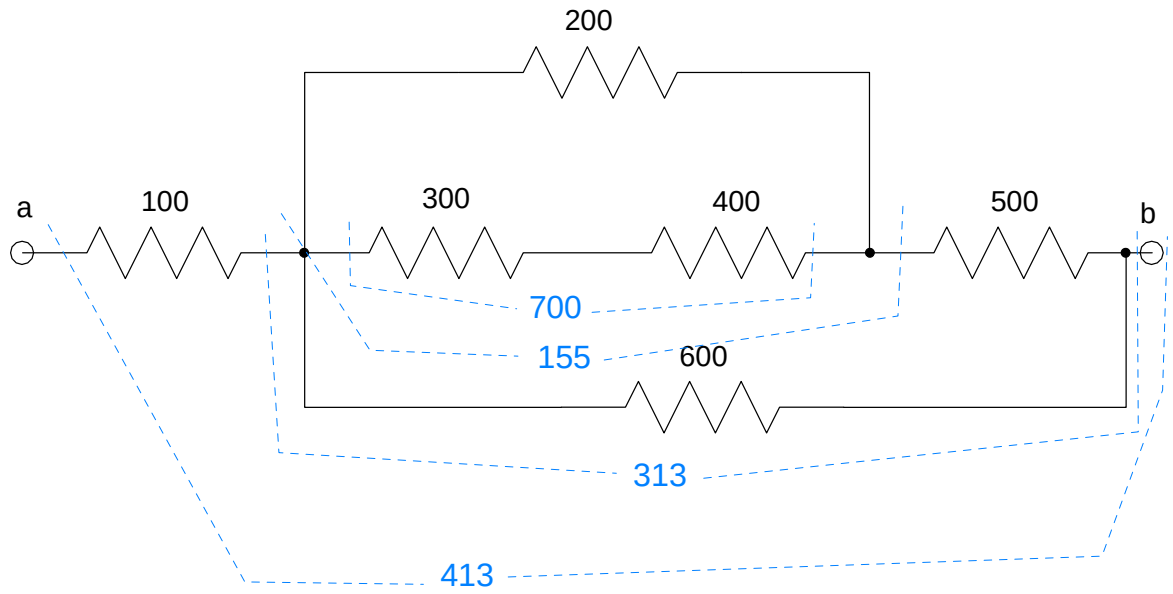
EE 206 Test #1c - Name _____

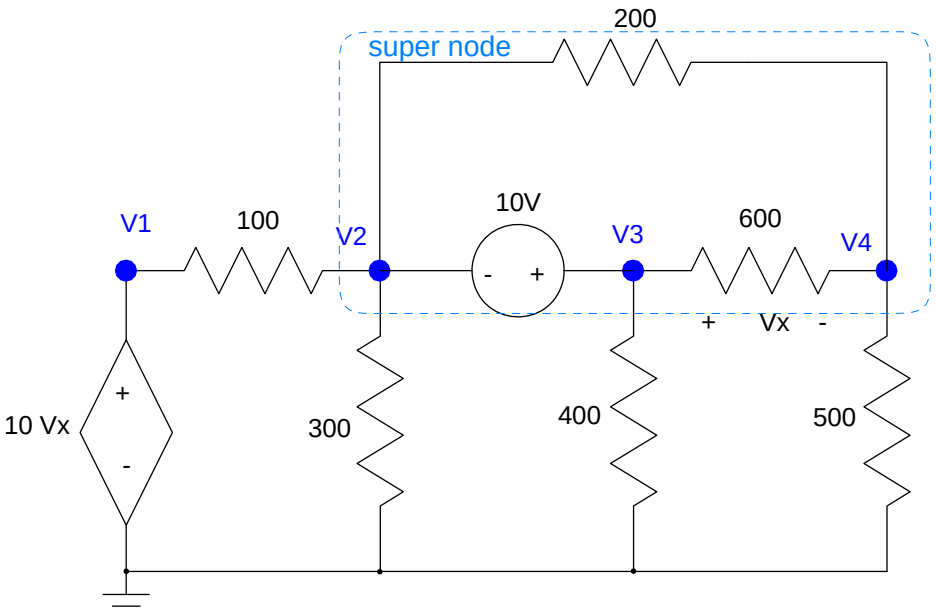
April 30 / May 1, 2019

1a) Determine the resitance Rab

Rab = 413.27 Ohms



2) Write N equations to allow you to solve for the N unknown votlages



- $V_x = V_3 - V_4$
- $V_3 - V_2 = 10$
- $V_1 = 10V_x$

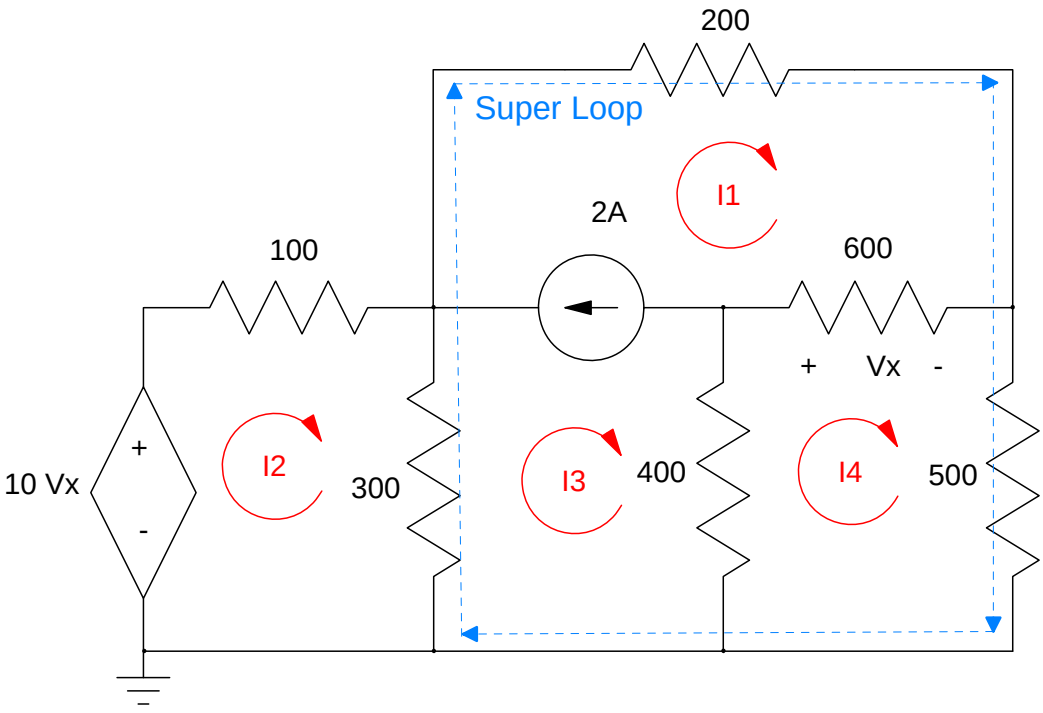
Node V4

- $\left(\frac{V_4 - V_2}{200}\right) + \left(\frac{V_4 - V_3}{600}\right) + \left(\frac{V_4}{500}\right) = 0$

Super-Node

- $\left(\frac{V_2 - V_1}{100}\right) + \left(\frac{V_2}{300}\right) + \left(\frac{V_3}{400}\right) + \left(\frac{V_4}{500}\right) = 0$

3) Write N equations to allow you to solve for the N unknown currents



- $V_x = 600(I_4 - I_1)$
- $I_1 - I_3 = 2$

Loop I2

- $-10V_x + 100I_2 + 300(I_2 - I_3) = 0$

Loop I4

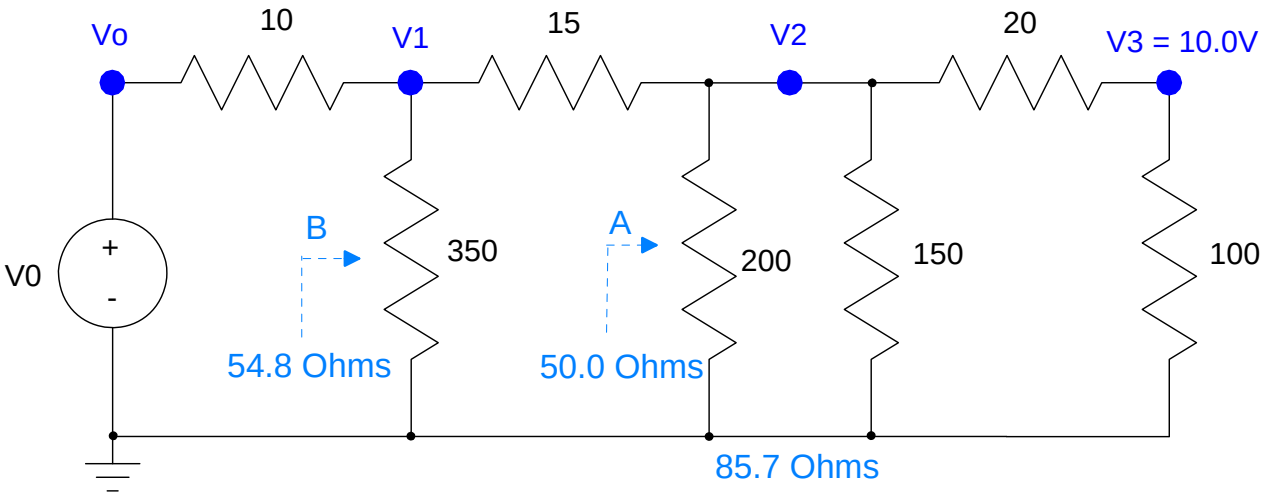
- $400(I_4 - I_3) + 600(I_4 - I_1) + 500I_4 = 0$

Super-Loop

- $300(I_3 - I_2) + 200I_1 + 500I_4 = 0$

4) For the following circuit, the voltage at V3 is measured as 10V. Determine the voltages V0, V1, V2 (hint: use voltage division)

V0	V1	V2	V3
18.4 V	**15.6 V**	**12.0 V**	10.0V



By voltage division

$$V_3 = \left(\frac{100}{100+20}\right) V_2 \qquad \Rightarrow V_2 = 12.0V$$

At point A looking right, you see 50.0 Ohms. By voltage division

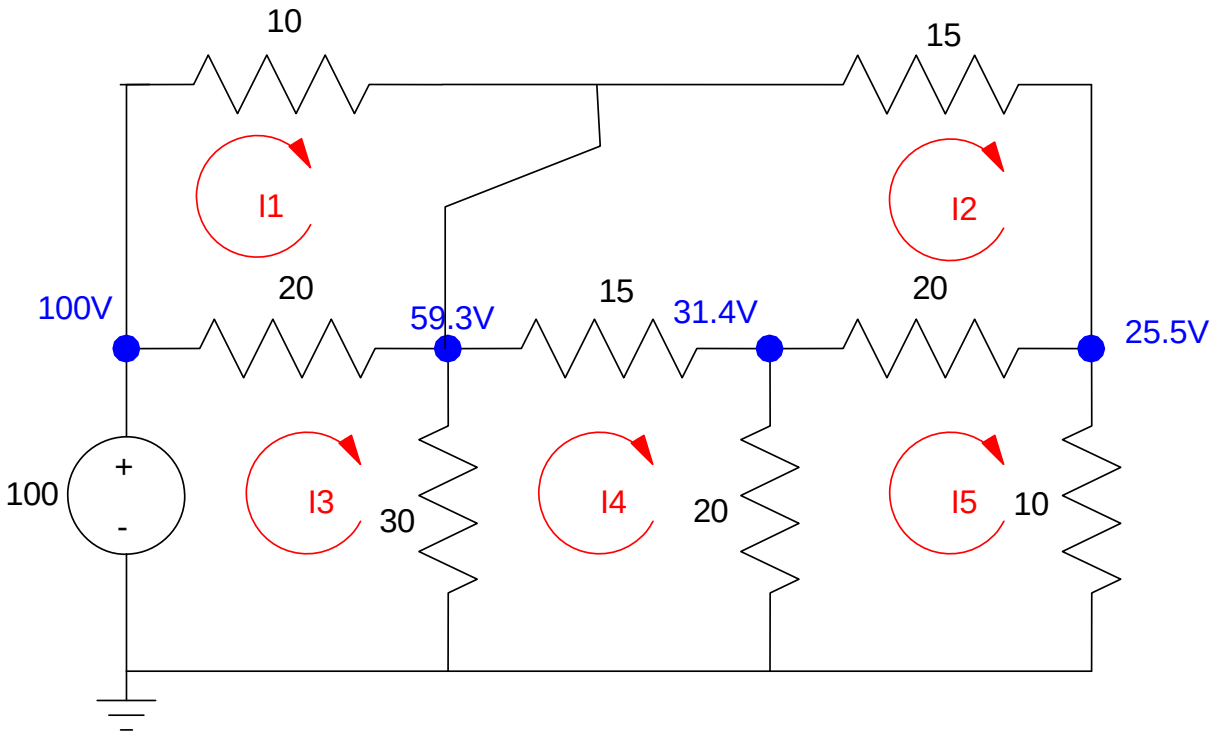
$$V_2 = \left(\frac{50}{50+15}\right) V_1 \qquad \Rightarrow V_1 = 15.6V$$

At point B looking right, you see 54.8 Ohms. By voltage division

$$V_1 = \left(\frac{54.8}{54.8+10}\right) V_0 \qquad \Rightarrow V_0 = 18.4V$$

5) Given the voltages, determine the loop currents

I1	I2	I3	I4	I5
4.07 A	**2.25 A**	**6.105 A**	**4.11 A**	**2.55 A**



$$I_1 = \left(\frac{100V - 59.3V}{10\Omega}\right) = 4.07A$$

$$I_2 = \left(\frac{59.3V - 25.5V}{15\Omega}\right) = 2.25A$$

$$I_5 = \left(\frac{25.5V}{10\Omega}\right) = 2.55A$$

$$I_3 - I_1 = \left(\frac{100V - 59.3V}{20\Omega}\right) = 2.03A \quad \Rightarrow I_3 = 6.105A$$

$$I_4 - I_2 = \left(\frac{59.3V - 31.4V}{15\Omega}\right) = 1.86A \quad \Rightarrow I_4 = 4.11A$$