EE 206 Test #1 - Name ___ $\overline{X} = 66\%$ $S = 18.7\%$

1a) Determine the resitance Rab

Rab = 755.55

700

$155.55 \, \Omega$
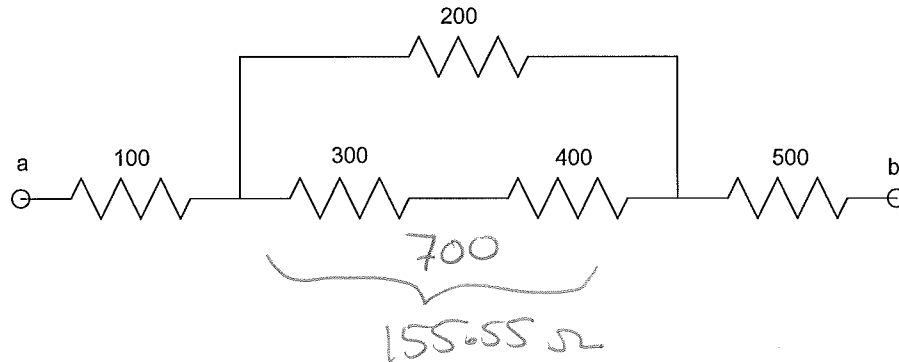
1b) Determine R so that Rab = 700 Ohms

R = 116.67

100

$\frac{1}{R} + \frac{1}{700} = \frac{1}{100}$

$R = 116 \, \Omega$
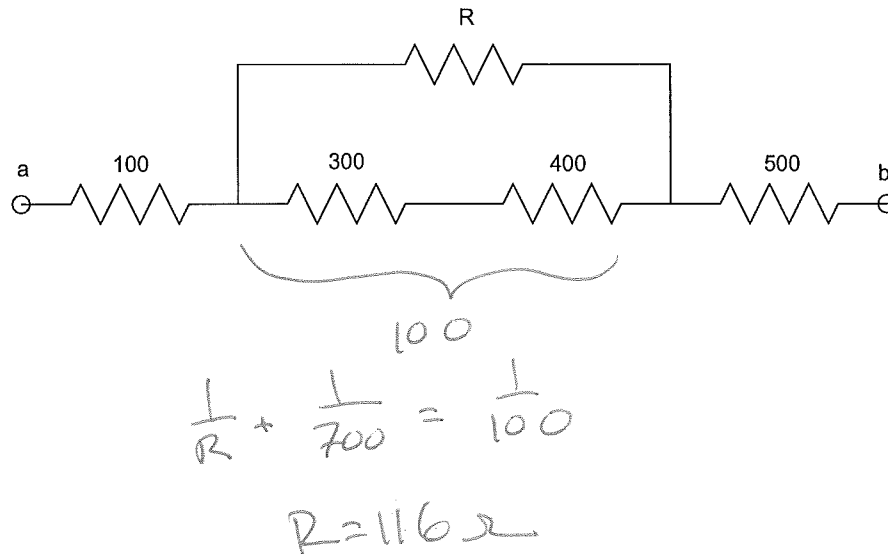
2) Write N equations to allow you to solve for the N unknown voltages
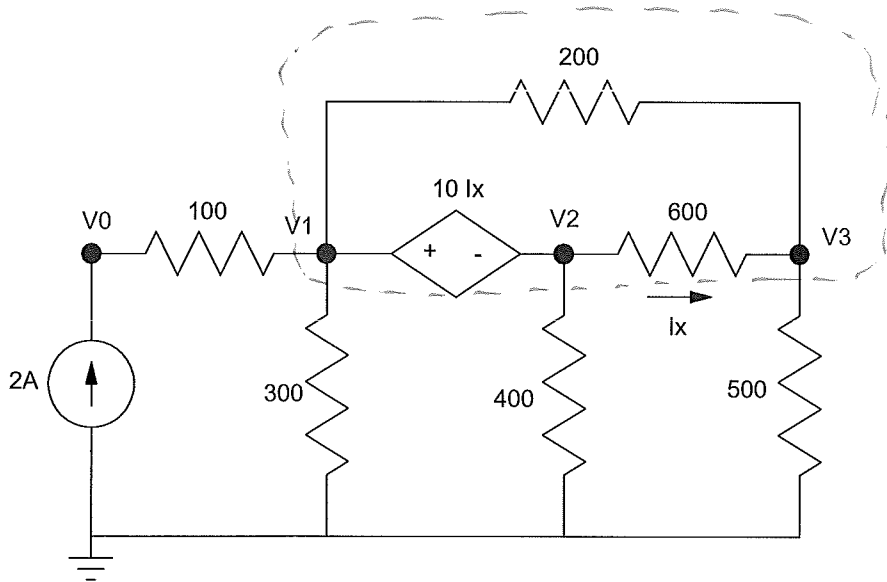
$$I_x = \frac{V_2 - V_3}{600}$$

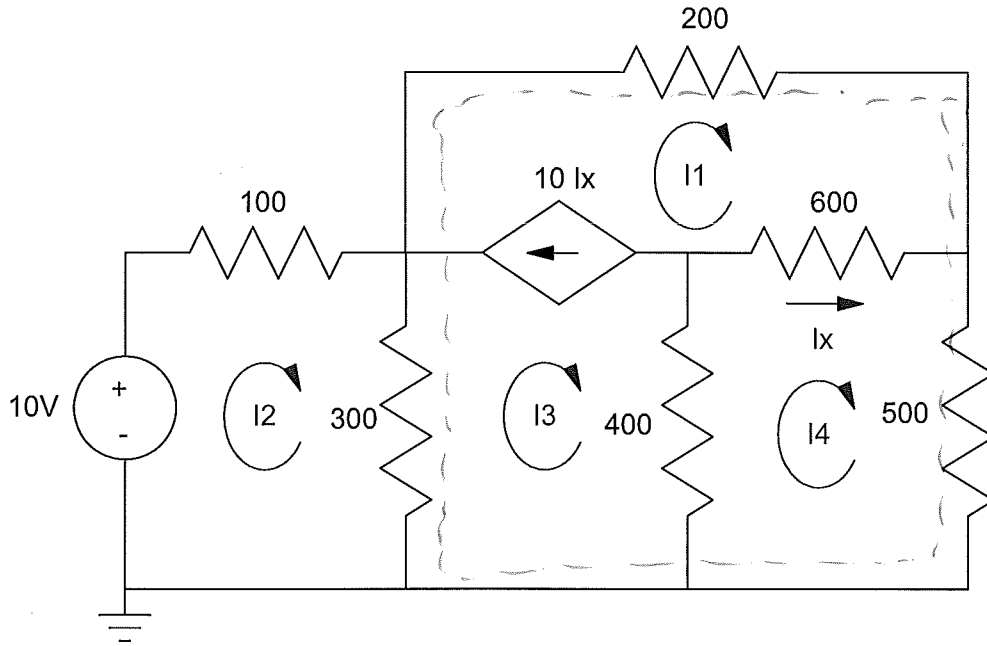$$V_1 - V_2 = 10 \, I_x$$

$$-2 + \frac{V_0 - V_1}{100} = 0$$

$$\frac{V_3 - V_1}{200} + \frac{V_3 - V_2}{600} + \frac{V_3}{500} = 0$$

$$\frac{V_1 - V_0}{100} + \frac{V_1}{300} + \frac{V_2}{400} + \frac{V_3}{500} = 0$$

supernode

4 pt each
20 pt total

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

$$I_x = I_4 - I_1$$

$$I_1 - I_3 = 10\, I_x$$
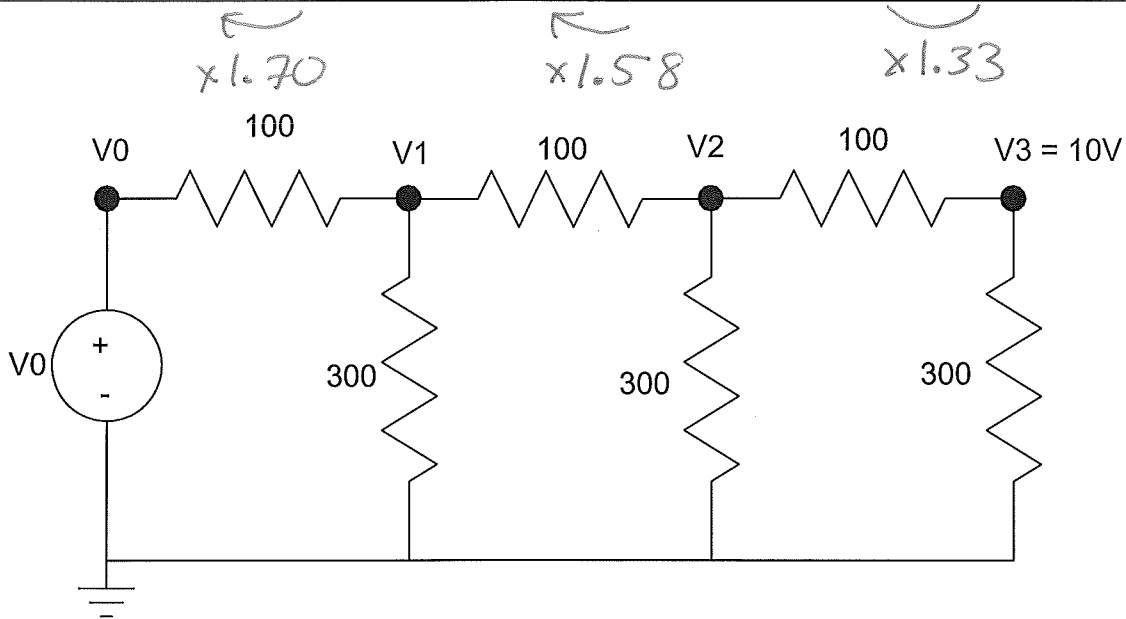
$$-10 + 100\, I_2 + 300\left(I_2 - I_3\right) = 0$$

$$400\left(I_4 - I_3\right) + 600\left(I_4 - I_1\right) + 500\, I_4 = 0$$

$$300\left(I_3 - I_2\right) + 200\, I_1 + 500\, I_4 = 0$$

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
35.92V	21.11V	13.33V	10.0V

$\times 1.70$ $\times 1.58$ $\times 1.33$

$$V_3 = \left(\frac{300}{300+100}\right) V_2 \quad \Rightarrow \quad V_2 = 13.33V$$

$$V_2 = \left(\frac{400\|300}{400\|300 + 100}\right) V_1$$

$$= \left(\frac{171}{171+100}\right) V_1 \quad \Rightarrow \quad V_1 = 21.11V$$

$$V_1 = \left(\frac{271\|300}{271\|300 + 100}\right) V_0$$

$$V_1 = \left(\frac{142}{142+100}\right) V_0 \quad \Rightarrow \quad V_0 = 35.92V$$
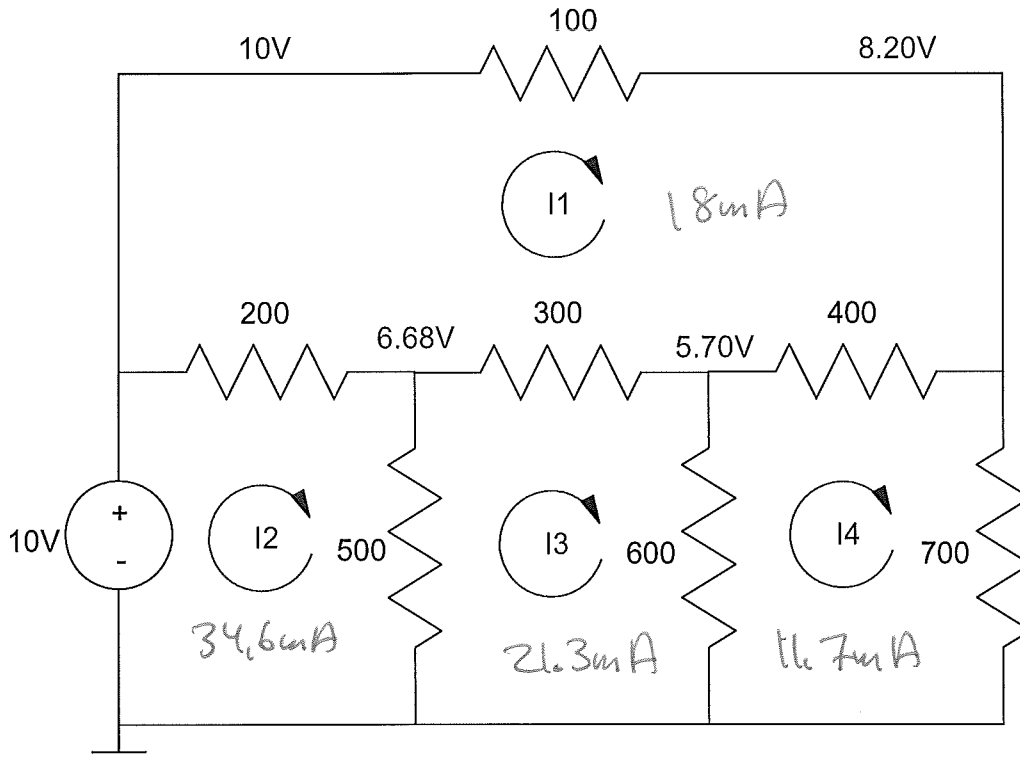
5) Given the voltages, determine the loop currents

I1	I2	I3	I4
~~34.6 mA~~ 18 mA	34.6mA	21.3mA	11.7mA

17.97   34.579   21.226   11.7186

$$I_1 = \frac{10 - 8.2}{100} = 18\,mA$$

$$I_4 = \frac{8.2V}{700} = 11.7\,mA$$

$$\frac{6.68 - 5.70}{300} = I_3 - I_1 = 3.3\,mA$$

$$I_3 = I_1 + 3.3\,mA = 21.3\,mA$$

Reich: 400
Forbes: 3

Bonus: There are 300 million people in the United States. How many people does it take for their total wealth to equal the total wealth of the poorest 150 million?

$$\frac{10 - 6.68}{200} = I_2 - I_1 = 16.6\,mA$$

$$I_2 = I_1 + 16.6\,mA = 34.6\,mA$$