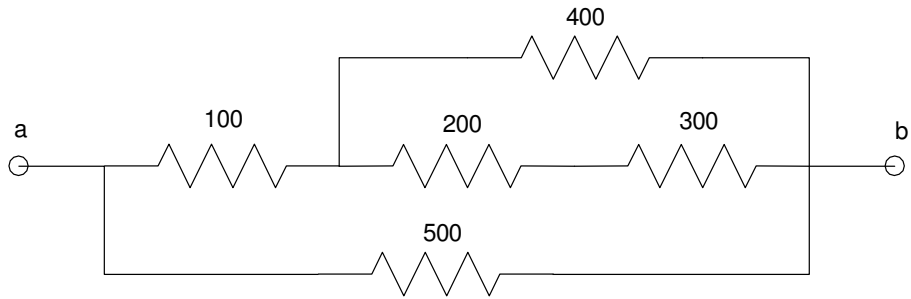# ECE 320: Handout #1
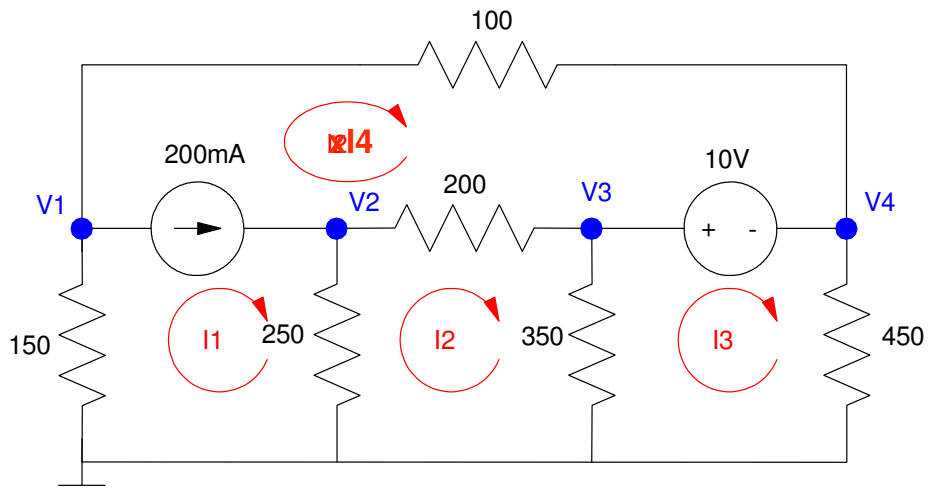
Circuits I Review

1) Find the resistance from a to b

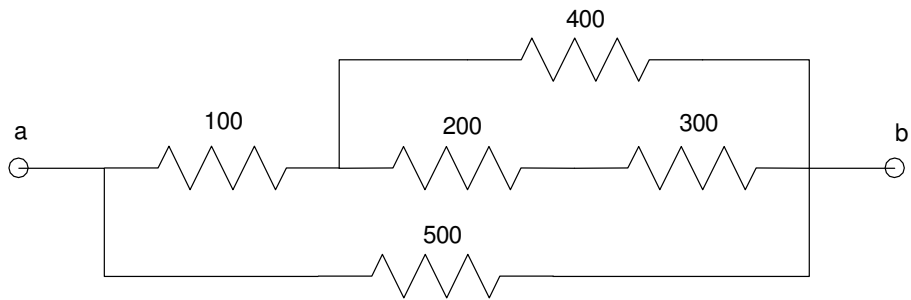

2) Write the voltage node equtions

3) Write the current loop equations

Solutions
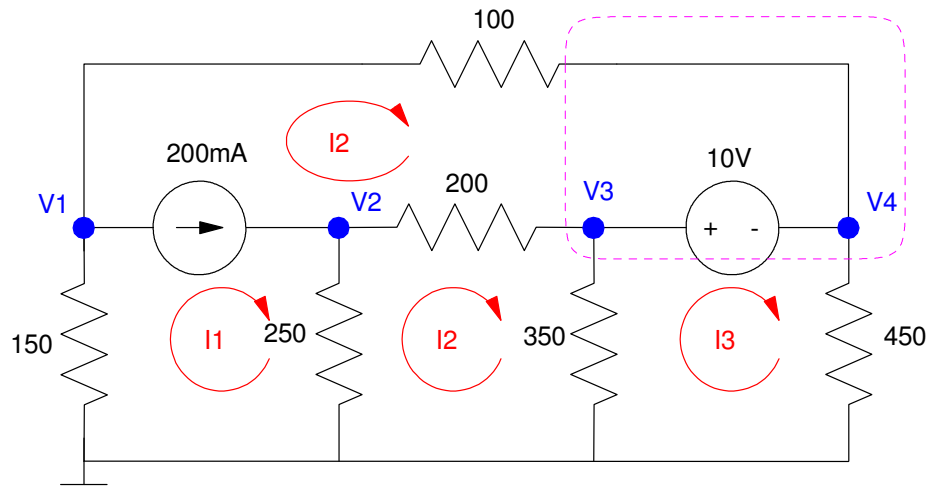
1) Find the resistance from a to b

200 + 300 = 500

500 || 400 = 222.22

222.22 + 100 = 322.22

322.22 || 500 = 195.95

answer: 195.95 Ohms

2) Write the voltage node equtions

Four nodes means you need 4 equations for 4 unknowns

Start with the easy one

$$V_3 - V_4 = 10$$

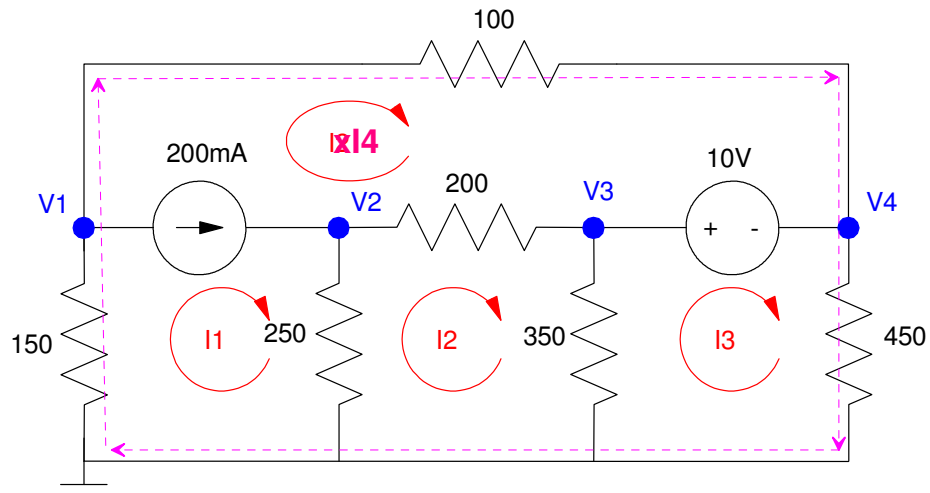Node equations (the sum of the current flowing from the node must be zero)

V1: $\left(\dfrac{V_1}{150}\right) + 200mA + \left(\dfrac{V_1-V_4}{100}\right) = 0$

V2: $-200mA + \left(\dfrac{V_2}{250}\right) + \left(\dfrac{V_2-V_3}{350}\right) = 0$

SuperNode (shown in pink): Other super nodes also work

$$\left(\dfrac{V_4-V_1}{100}\right) + \left(\dfrac{V_3-V_2}{200}\right) + \left(\dfrac{V_3}{350}\right) + \left(\dfrac{V_4}{450}\right) = 0$$

3) Write the current loop equations

Four unknown current loops. Write 4 equations for 4 unknowns.

Start with the easy one

$$I_1 - I_4 = 200mA$$

Loop Equations: The sum of the votlage drops around any closed path must be zero.

Loop I2

$$250(I_2 - I_1) + 200(I_2 - I_4) + 350(I_2 - I_3) = 0$$

Loop I3

$$350(I_3 - I_2) + 10 + 450I_3 = 0$$

SuperLoop

$$150I_1 + 100I_4 + 450I_3 = 0$$