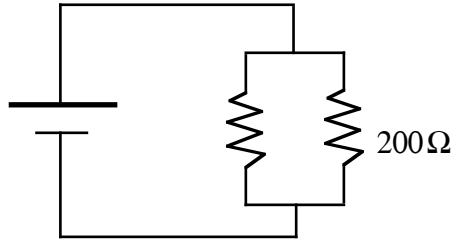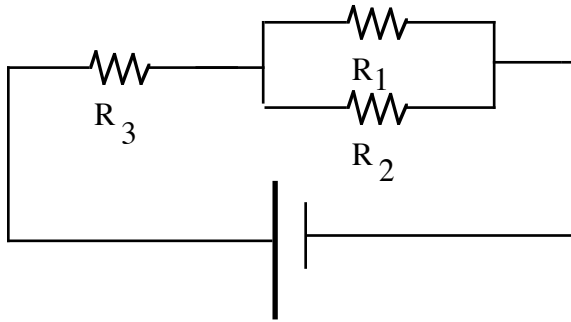# Homework V

Session IV.3

For the following problems, use whatever circuit analysis techniques you prefer.

1. For the following circuit, the total current out of the battery is 105 mA, and the current through the 200 Ω resistor is 30 mA. What is the resistance of the second resistor? Explain your reasoning.
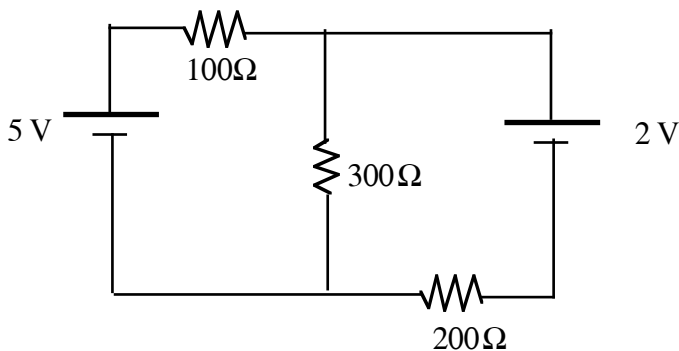

2. How much current flows through the battery below,

where $R_1 = 300\Omega$, $R_2 = 600\Omega$, $R_3 = 300\Omega$, and the battery voltage is 5 V?

3. Consider the circuit below.

Solve for the current (magnitude and direction) flowing through each circuit element.

Session V.1

4. A capacitor has a capacitance of 200 μF. What is the charge stored on it when it is connected to a 5 V battery? How high a voltage do you need to apply to this to double this amount of stored charge?

5. A capacitor with capacitance 2 mF (milliFarads) is connected to a constant current supply, which supplies 1 mA. What is the amount of charge stored on the capacitor after 3 seconds? What is the voltage on the capacitor after 5 seconds? Voltage and charge after t seconds?

6. A capacitor is charged to a voltage of 4 V. It is then removed from the battery and connected to a 2000 Ω resistor, as shown, where it is allowed to discharge.

Charge Capacitor   Discharge through Resistor
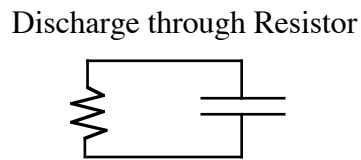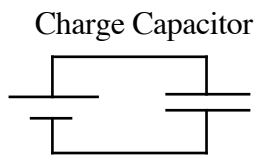
a) Immediately after it is connected, what is the current flow through the resistor? (Hint: compare this to a 4 V battery connected to the resistor.)

b) Shortly thereafter, the capacitor has been discharged to a voltage of 2 V. At that point, what is the current flow through the resistor?

c) Remember that the current flow is the time rate of change of the charge on the capacitor. With this in mind, and the results to a) and b), sketch qualitatively the charge on the capacitor as a function of time during the discharge process.

7. We have two capacitors, one with C = 1 x 10^{-3} F and the other with C = 5 x 10^{-4} F.

a) What is the effective capacitance of these two in parallel?

b) What is the effective capacitance of these two in series?