ECE-240 Homework II

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1. Find the current through and voltage across each resistor in Figure 1.

2. Find the equivalent resistance of the resistive neetwork in Figure 2.

3. Consider the circuit in Figure 3. This is one realization of a voltage divider. If a voltage V is applied across V_{in}, what will V_{out} be? We will call this voltage V_d

4. In considering the behavior of a circuit, we often want to know the circuit's response to a "load". A load is a circuit element or network of circuit elements attached across the output of the circuit. Consider a resistive load R_L placed across the output – how does it affect the output voltage?

5. This is a problem – an ideal voltage divider would be unaffected by a load, and would act as a voltage source at the divided voltage V_d no matter what. Consider the loaded circuit – how can one adjust R so that the divider behaves more ideally? **Hint**: look at the formula for parallel equivalent resistance.

6. If R is adjusted in such a way, what is the effect on the current received by the load?

7. If R is adjusted in such a way, what is the effect on the power consumed by the resistors in the voltage divider circuit (unloaded)?

8. Suppose you want to make a voltage divider which gives, unloaded, an output voltage of $V_{in}/4$. What would you change?

9. Imagine you are in the lab. You have a 10V voltage supply, but you want to supply 2.5V to a load of 100kΩ. You construct a voltage divider like the one you described in the previous question. Pick resistor values, and see how close the loaded voltage is to 2.5!
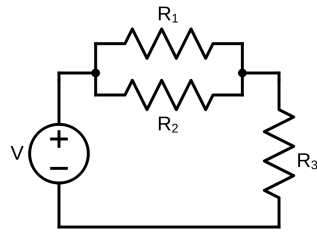
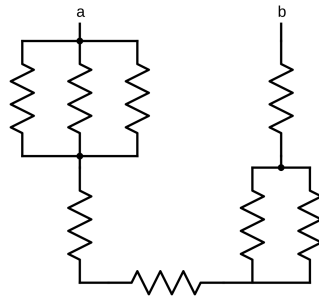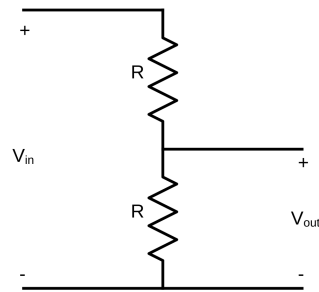Figure 1: A first circuit to analyze.

Figure 2: A network of resistors.

Figure 3: An example of a voltage divider.