

Physics 261

Homework # 3

Remember to show your work.

1. Design a circuit that uses a 10 V battery and some resistors to output voltages of 7 V, 3 V, 2 V, and ground.
2. A 1 mA current source is connected to two resistors in parallel, with values of $10\ \Omega$ and $40\ \Omega$.
 - (a) Sketch the circuit, and use the concept of a current divider to find the currents in each of the resistors.
 - (b) The current source is replaced by a 1 kV power supply in series with a $1\ \text{M}\Omega$, 0.1% precision resistor. Find the current through this new supply, keeping an appropriate number of significant figures.
 - (c) Explain in words why the substitution in (2b) works.
3. Verify the 5 voltages derived in the “more nodes” example on page 9 of Lecture 3. Instead of node voltage analysis, break the circuit down into parallel and series resistor combinations. What is the total (equivalent) resistance of the circuit?
4. Solve the circuit below by node voltage analysis. Label your own sketch of the circuit with voltage variables and ground. Solve for the currents in all five resistors, and label the sketch accordingly.

