Physics 334, Winter Quarter 2012
Homework Assignment 1

Due Tuesday January 10 in class or in my mail box before the end of class.

1. Exercise 1.5 in the textbook with this twist: If the circuit is allowed to include capacitors and inductors, find a counter-example circuit to the problem premise and explain your reasoning.

2. You are given a "black box" with two terminals and proceed to measure its "I-V" curve, finding the following two points on the curve: $(2I_b, V_b)$ and $(I_b, 5V_b)$. (a) Accurately sketch the "I-V" curve. (b) From this curve, find the Thévenin voltage and resistance V_{Th} and R_{Th}, as well as the Norton current and resistance I_N and R_N.

3. A "black box" with 3 terminals labeled E, B and C is shown in the circuit below. Assume terminal B is magically always 0.6 V more positive than terminal E, and I_d is very large compared to the current flowing into terminal B. (FYI, this black box is an NPN bipolar transistor.) (a) Find V_C and V_E. (easy to do) (b) Find R_1 and R_2. Hints: "Assume terminal B is always 0.6 V more positive than terminal E, …" implies what "dynamic" resistance between terminals B and E? And why does it help that I_d is relatively large?