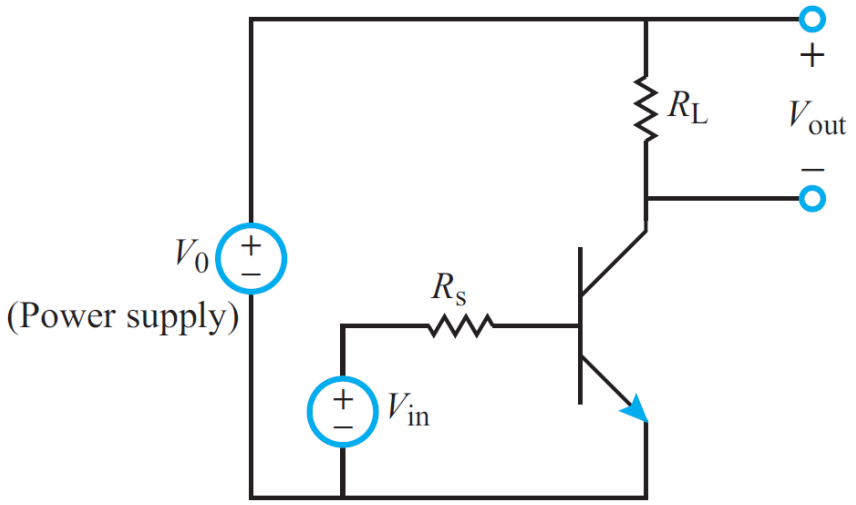
HW 3
Posted Monday 2/13/2012
*Due **Wednesday** 2/22/2012*
EE40
Maharbiz
Spring 2012

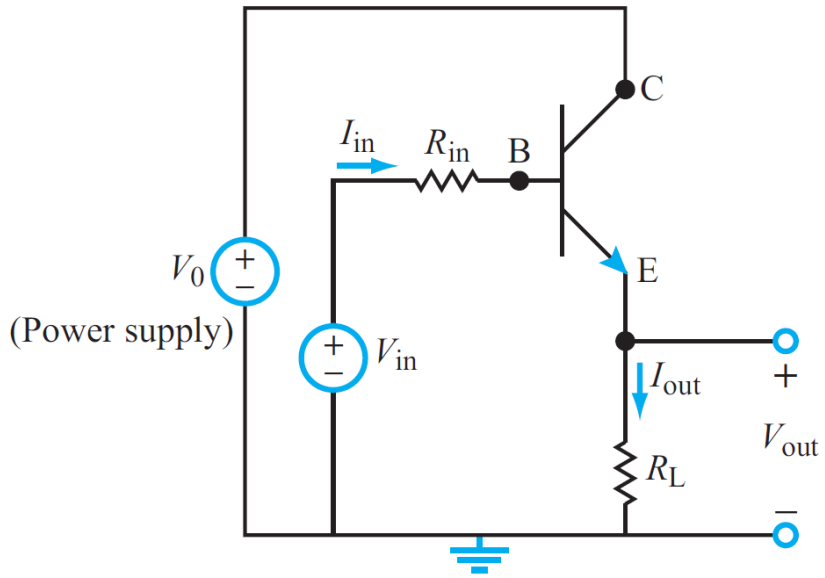
If you're taking EE105 next semester, you'll thank me for problems 1 and 2. ☺

1. The circuit below is a BJT *common emitter amplifier*. Find V_{out} as a function of V_{in}. This may seem hard to parse at first, but it is actually pretty straightforward. Carefully replace the BJT symbol with the model for a BJT we used in class, making sure the base (B), emitter (E), and collector (C) terminals are connected properly, then use any method you want to solve for V_{out}!



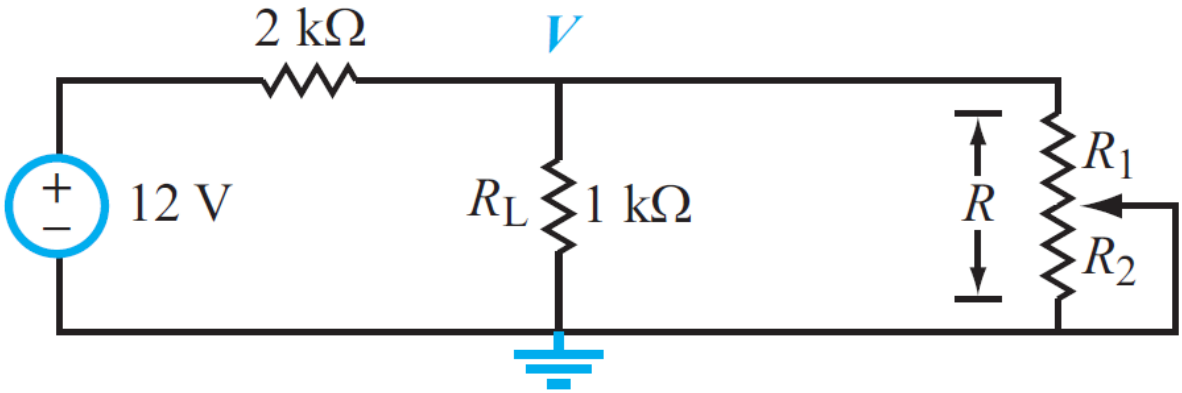
2. The circuit below is a BJT *common collector amplifier*. Find both the voltage gain ($A_V = V_{out} / V_{in}$) and the current gain ($A_I = I_{out}/I_{in}$). As with Problem 1, this may seem hard to parse at first, but it is actually pretty straightforward. Carefully replace the BJT symbol with the model for a BJT we used in class, making sure the base (B), emitter (E), and collector (C) terminals are connected properly, then use any method you want to solve for V_{out}!

For this problem, you can assume $V_{in} \gg V_{BE}$.



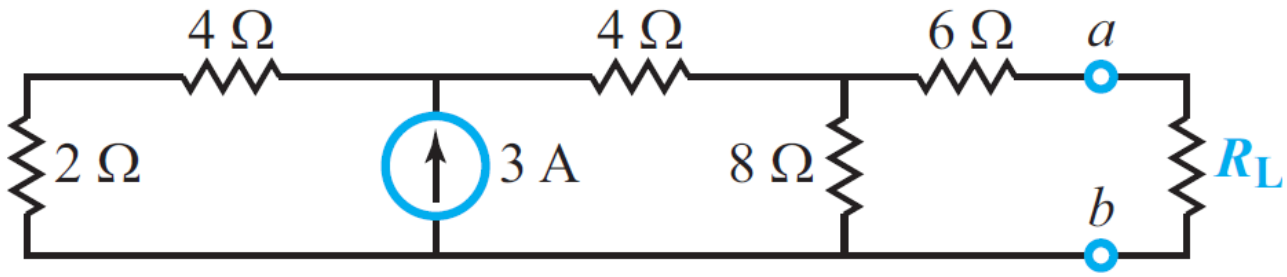
3. In the circuit shown below, a potentiometer is connected across the load resistor R_L. The total resistance of the potentiometer is $R = R_1+R_2 = 5$ kW.

(a) Obtain an expression for the power P_L dissipated in R_L for any value of R_1.
(b) Plot P_L versus R_1 over the full range made possible by the potentiometer's wiper.

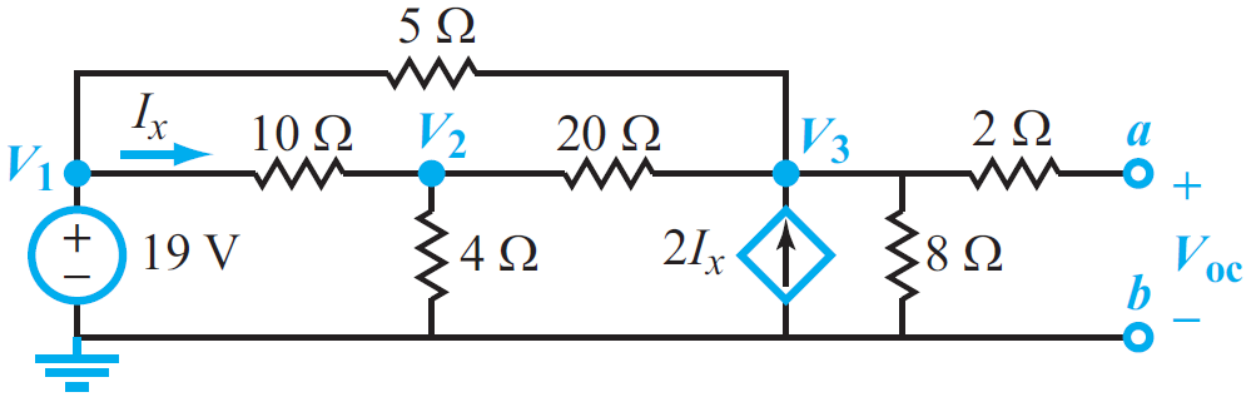


4. a) What value of the load resistor R_L will extract the maximum amount of power from the circuit below?
b) How much power will that be?

Hint: you need to use both the concepts of Thevenin equivalent circuits and maximum power transfer.



5. Find the Thevenin equivalent circuit at terminals (a,b) of the circuit below:



6. Find the Norton equivalent circuit of the circuit.