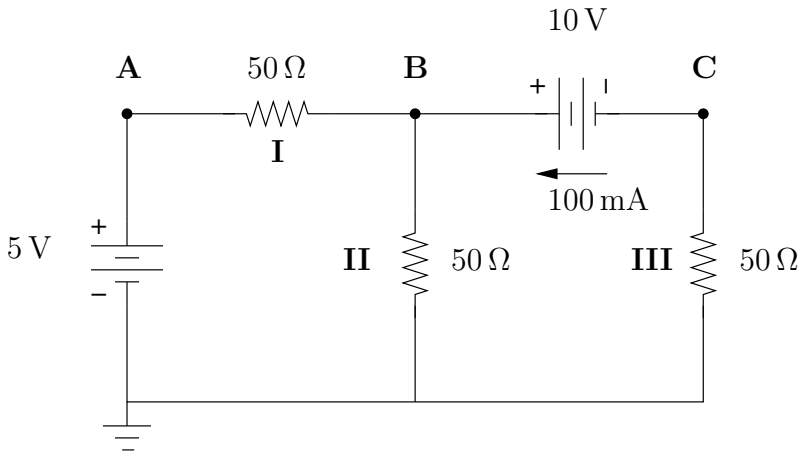
PHYS 235 — Exam #1
Tuesday, February 12, 2008

Name:_____

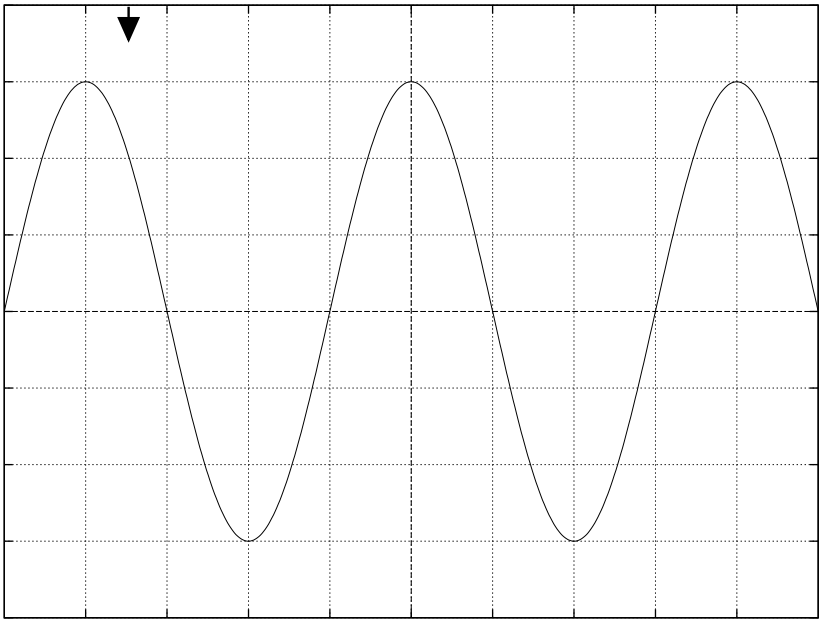
1. Consider the illustrated circuit with the indicated values for the circuit elements. I have determined that a current of 100 mA flows out of the 10 V battery in the indicated direction.

   (a) Determine the voltages at points A, B, and C in the circuit.

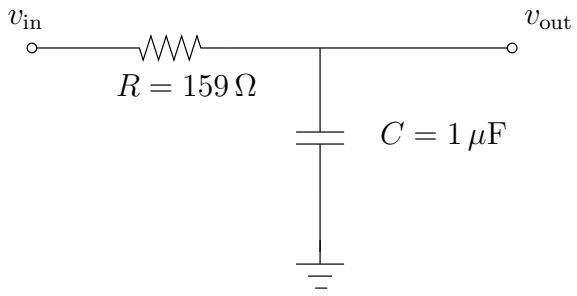
   (b) Determine the currents through resistors I, II, and III. (Be sure to indicate directions for all currents.)



2. The oscilloscope screen below shows the input voltage v_{in} for the illustrated RC circuit. You may assume that the scope is set so that the horizontal axis in the middle of the screen is ground (0 V).



CH1 20.0 mV $\qquad$ 250 μs

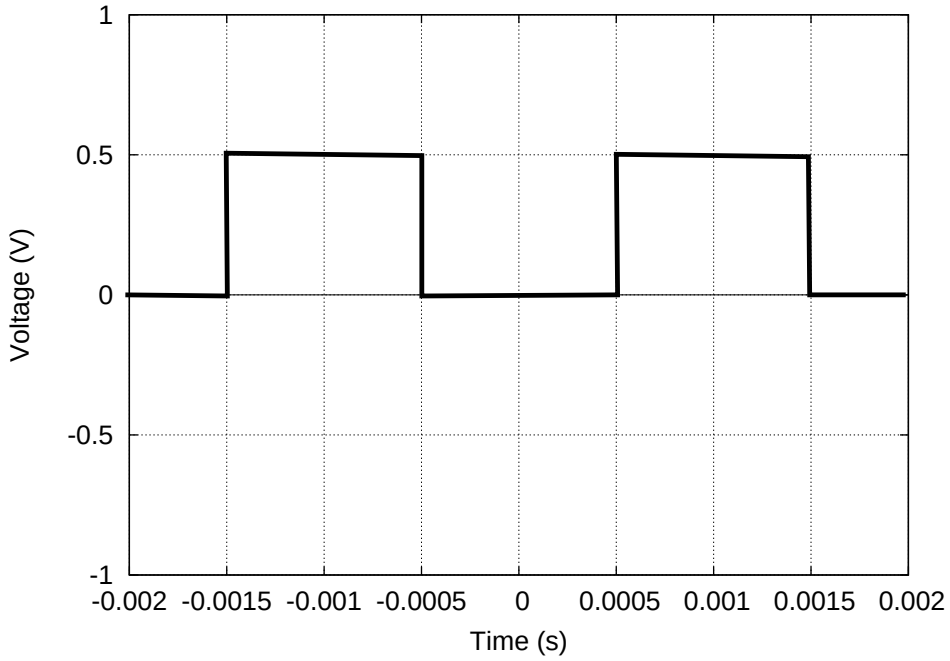


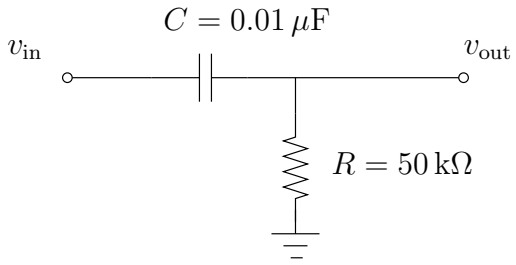
(a) What is the Trigger Slope setting: Rising or Falling?

(b) What is the Trigger Level setting?

(c) Determine the output voltage v_{out} and draw the output waveform on the graph above. (Derive all formulas you need.)

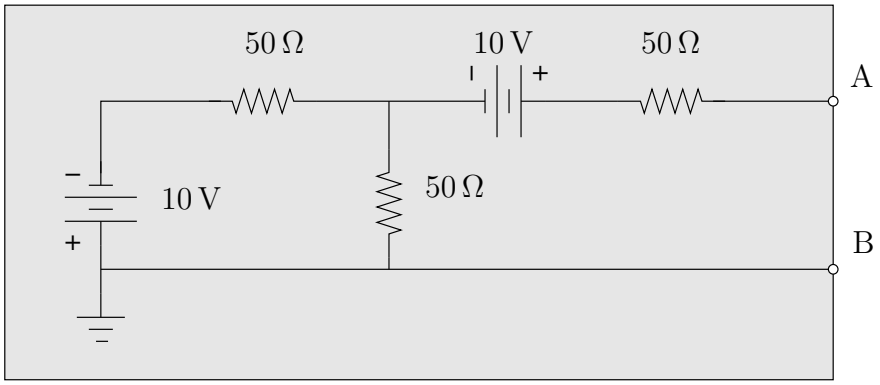
5. The graph below shows the input to the illustrated circuit. On the same graph sketch the output.





4. (a) Calculate the Thévenin equivalent voltage V_{Th} of the circuit in the shaded box. Notice the polarity of the batteries.

   (b) Calculate the Thévenin equivalent resistance R_{Th} of the circuit in the shaded box.



5. You are given a box with two terminals. You are told that the Thévenin equivalent voltage for the circuit in the box is $V_{\mathrm{Th}} = 6\,\mathrm{V}$ and the Thévenin equivalent resistance is $R_{\mathrm{Th}} = 10\,\Omega$. You connect a $20\,\Omega$ resistor across the terminals of the box. Calculate the magnitude of the current that flows through the $20\,\Omega$ resistor.