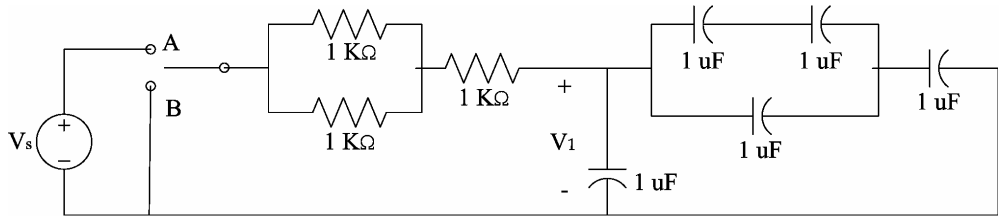
All the normal rules apply: *Due next class, work on separate paper, start early, show your work, label everything (especially on graphs -including axes, time/voltage divisions, function plots, values, etc.), specify units, circle answers.*

Watch your units!

1. For the figure below:



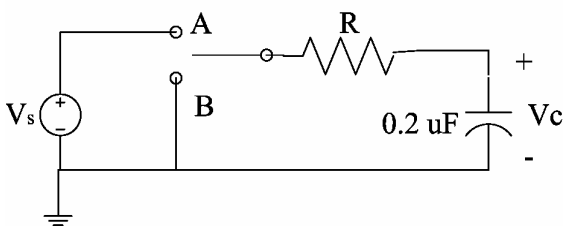
   a. Simplify the circuit and find the time constant τ. Hint: $\tau = R_{eq} \cdot C_{eq}$

   b. Plot the charge and discharge curves for V_1 using the 2/3 estimation method shown in class using at least four points. Your plot should go out to at least $t = 4\tau$. To plot the charge curve, assume the switch has been in position B for a long time and switches to position A at $t = 0$. For the discharge curve, assume that the switch has been at A for a long time, and switches to B at $t = 0$.

   c. Assume $V_s = 10$ v. Plot the charge and discharge curves for V_1 using the exponential formula used in class. Your plot should go out to at least $t = 4\tau$ using at least four points.

2. For the circuit below, assume $V_s = 5$v and R is unknown. In the lab we observe the charge curve for this circuit on an oscilloscope. We measure the following:

   $V_C = 0.5$v when $t = 50$ us
   $V_C = 4.5$v when $t = 1150$ us.



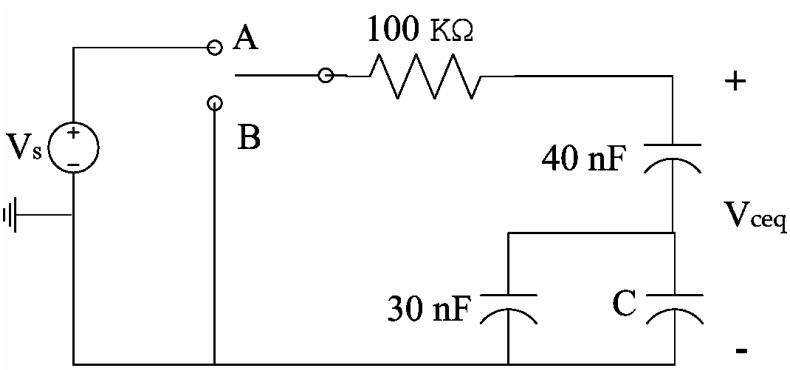
   a. Using the 10% - 90% rise time rule of thumb, calculate the time constant τ for this circuit.

   b. Using your results from part a, determine the value of R.

   c. Assume the switch has been in position A for a long time and switches to B at $t = 0$. Plot V_C for $0 < t < 4\tau$ using at least four points. Show all your work! Be sure to plot and confirm that your 10% values and 90% values match those used earlier. (Remember that the rule of thumb for the earlier calculation is an approximation).

   d. Assume the switch has been in position B for a long time and switches to A at $t = 0$. Plot V_C for $0 < t < 4\tau$ using at least four points. Show all your work! Be sure to plot and confirm that your 10% values and 90% values match those used earlier. (Remember that the rule of thumb for the earlier calculation is an approximation).

3. For the figure below: $\tau = 2$ ms, $V_s = 15$ v.



a. Determine the value of C.

b. Assume the switch has been in position A for a long time and switches to B at $t = 0$. Plot V_{ceq} for $0 < t < 4\tau$ using at least four points. Show all your work!

c. Assume the switch has been in position B for a long time and switches to A at $t = 0$. Plot V_{ceq} for $0 < t < 4\tau$ using at least four points. Show all your work!