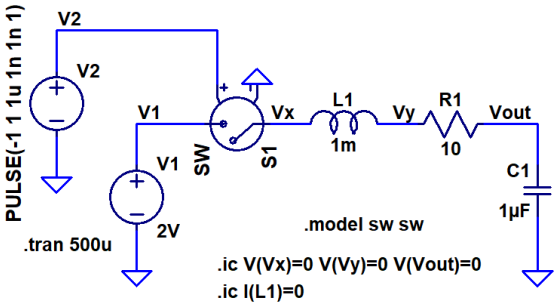
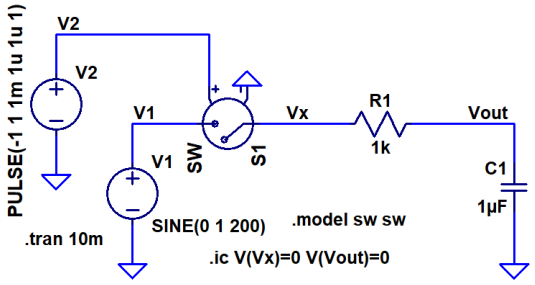
H.W. #16 EE 221 Spring 2021

Show your work for credit and put a box around each of your answers (follow the hw guidelines!)

1. Using the Laplace transform solve for Vout in the following circuit. Note that for all intents and purposes the switch closes at basically t=0. Verify your answer using LTspice. (5 points)



2. Repeat problem 1 for the following circuit. Note in this problem the switch closes at t = 1ms which isn't nearly t = 0. (5 points)



3. Design problem – examine the circuit seen below. You've been tasked with selecting: 1) the voltage rating of the capacitor and 2) the value of the capacitor. The voltage rating is the maximum value that can be applied across the capacitor without damaging the capacitor. Knowing that good design doesn't select a value that "just meets the requirements" but rather is larger to ensure that with variations in the capacitor's value when it's made, variations with the voltages seen below, aging, etc. the capacitor operation is reliable (to simplify things assume that each voltage source **can stop oscillating** at any value within its range of operation, for example, V1 and be any value between +32V and –32V while V2 could be stop between +48 and -48). For selecting the value assume the capacitor's impedance has to be relatively small (at what frequency would you use?). Use digikey.com to select a real capacitor. Note that it's desirable to use as small of capacitance with as low of a voltage rating as possible to minimize cost and size (consumers don't like large and expensive electronics). Using LTspice to show that the voltage drop across the capacitor is small for a range of resistor values. (4 points)