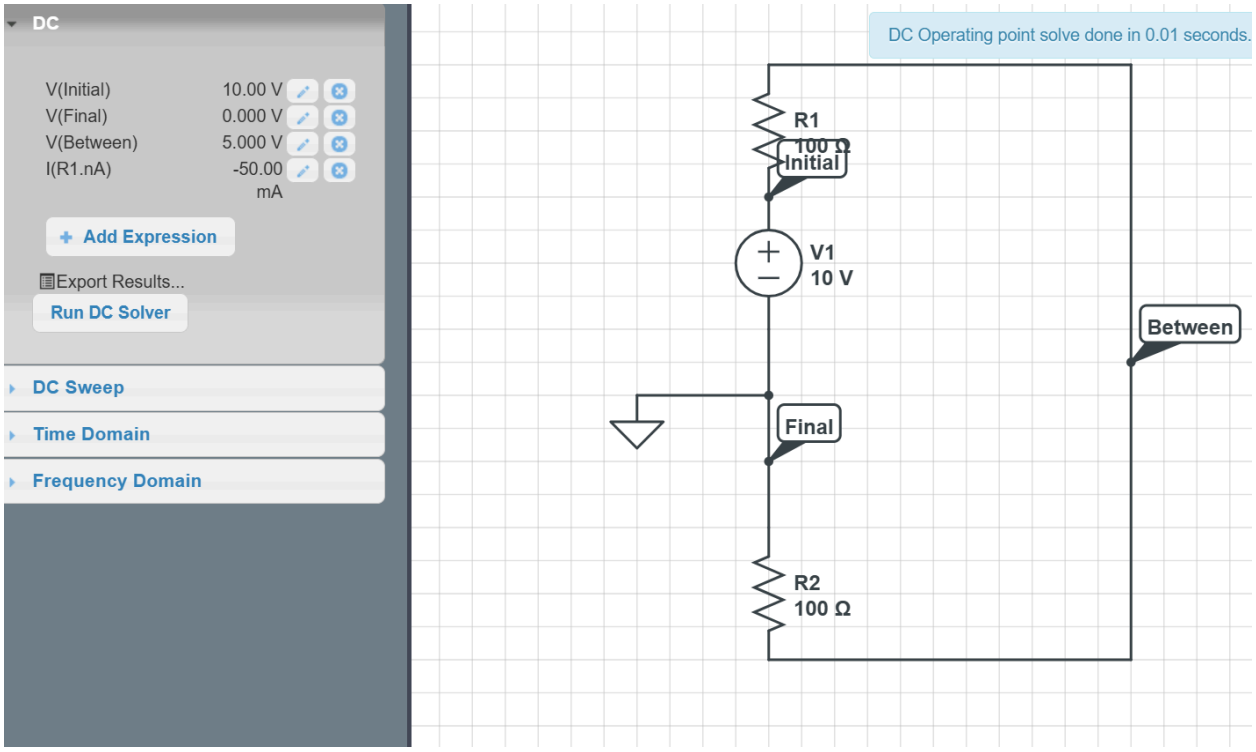
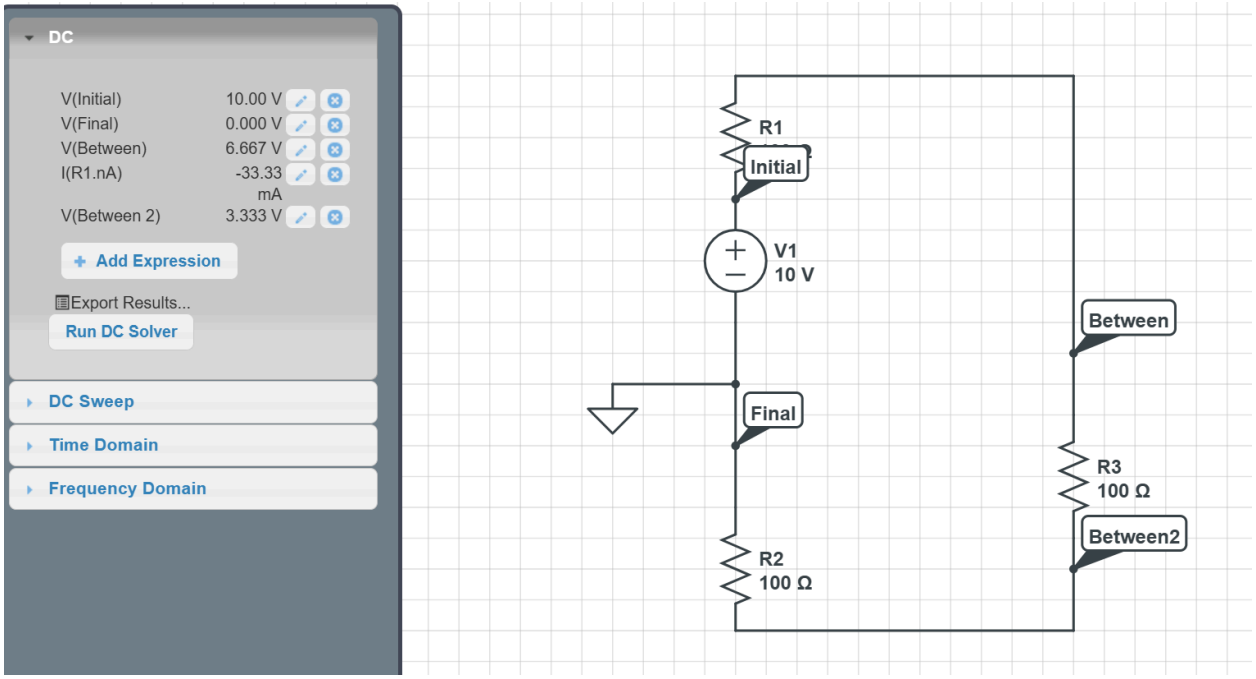
1.Examine the voltage values at each node and the current for the system



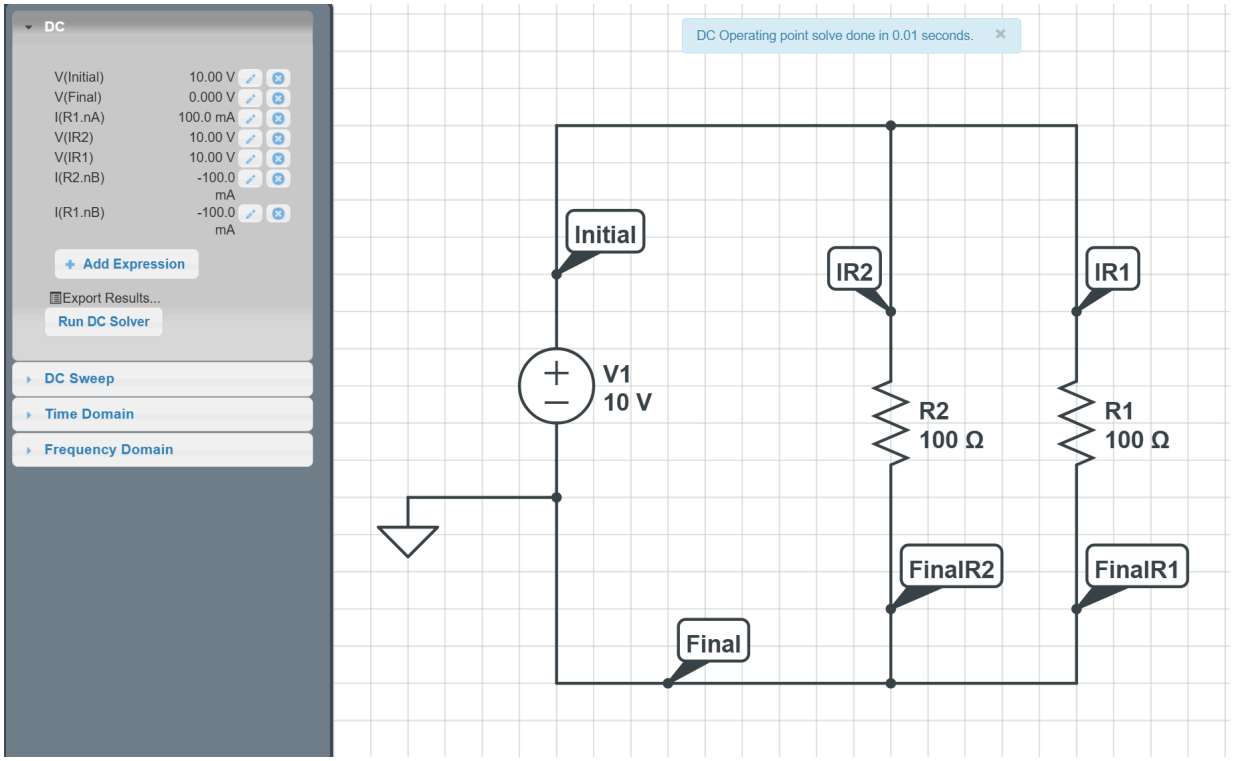
Values differ at each node: Initial Voltage (Node 1): 10 V, Between Voltage (Node 2): 5V, and Final Voltage(Node 3): 0V. Current: -50 A

d. Add a third resistor and an additional node and make note of how this changes the voltage at each node and the current in the system:



2. **Resistors in parallel**

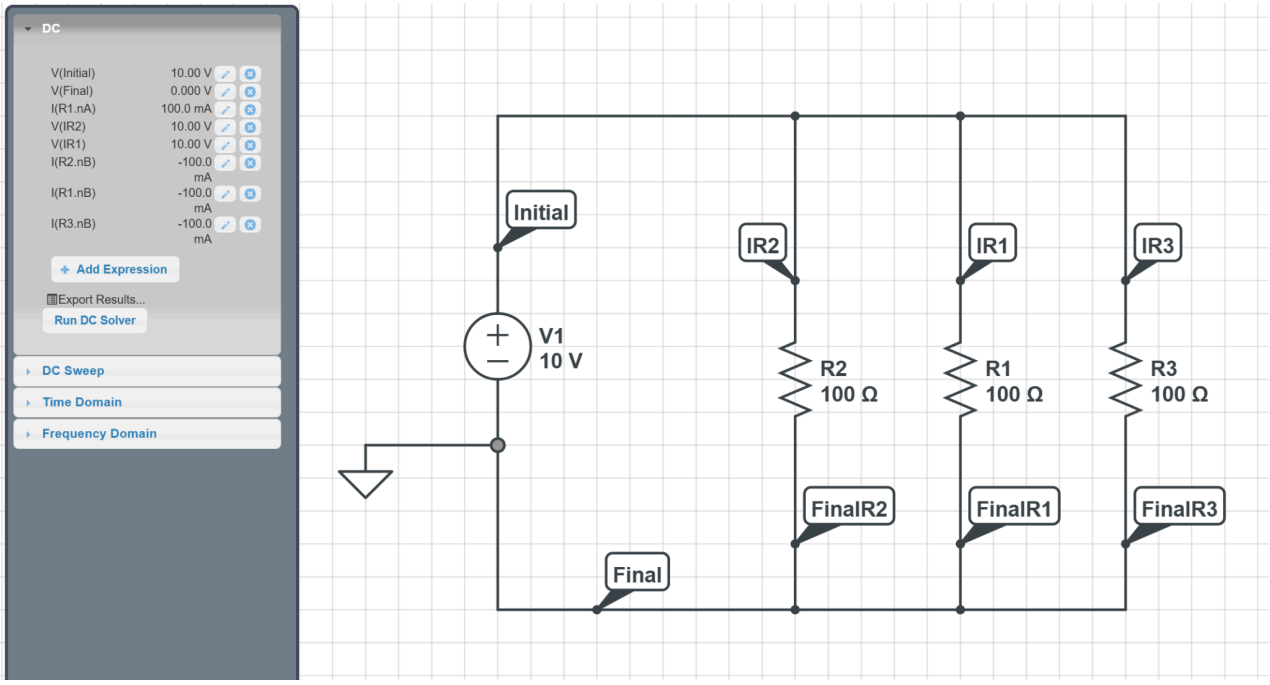
Examine the voltage values at each node and the current across the voltage source and each resistor



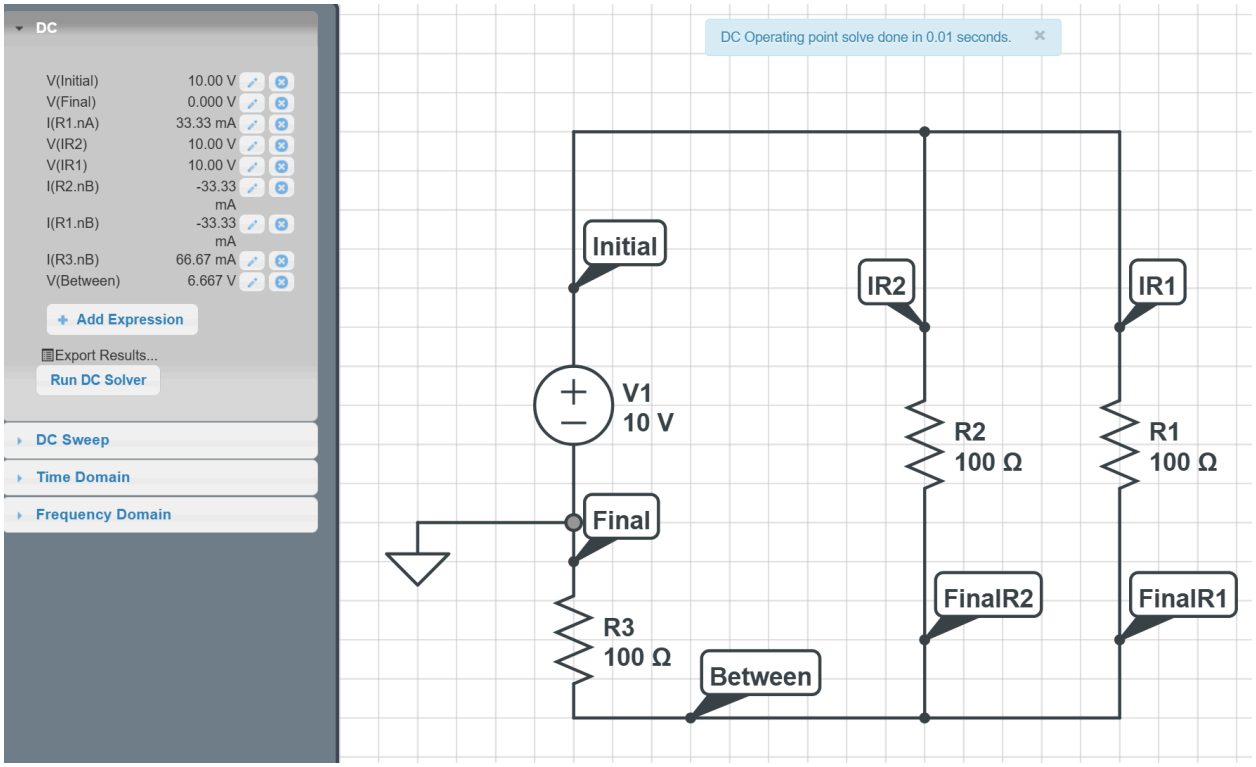
The voltage values at each node are the same: 10 V, until the final node: 0 V. Current R1.nA: 100 mA, R2.nB: -100mA, R1.nB: -100mA.

a. Add a third resistor in parallel and additional nodes. Make note of how this changes the voltage at each node and the current across each resistor.

b.

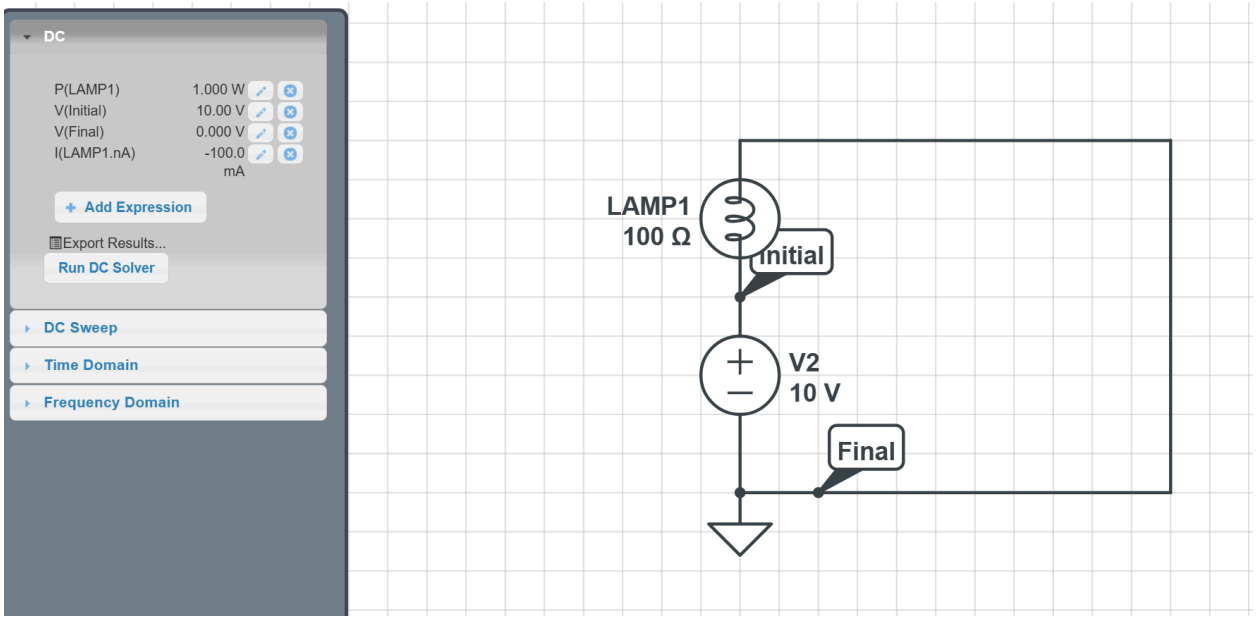


3. Resistors in series and parallel
   a. Build a circuit with a 10V voltage source with two resistors in parallel and a third resistor in series – the third resistor is in series with each parallel resistor in a single loop. **Examine the voltage value at each node and the current across the voltage source and each resistor. Make note of how this compares to either the case of resistors only in parallel or only in series.**

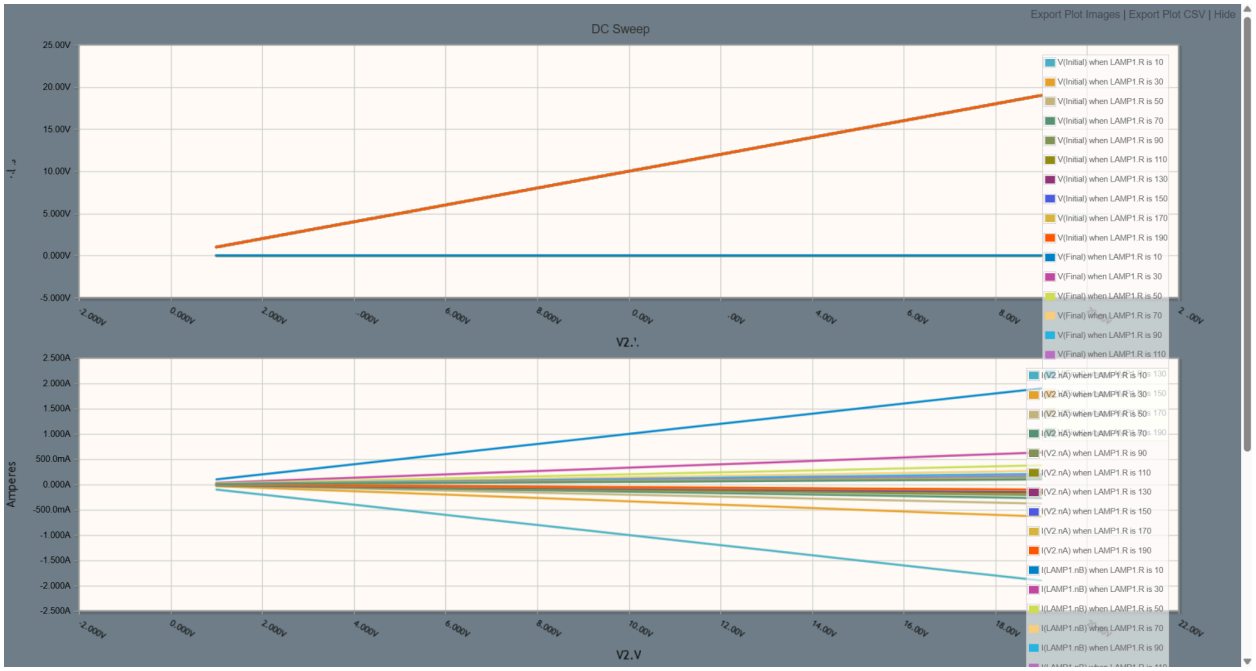


Initial Node: 10 V, IR1: 10V, IR2: 10 V, V BetweenL: 0.667 V Final node: 0 V. Current: R1.nA: 33.33mA, R1.nB:-33.33 mA ,R2.nb: -33.33mA, R3: 66.67 mA

4. Powering light bulbs
   a. Build a circuit with a 10V voltage source with a single 100Ohm lightbulb connected. What will the power output be for this lightbulb?
   b. Use the simulation DC solver to evaluate the lightbulb power and check your answer.

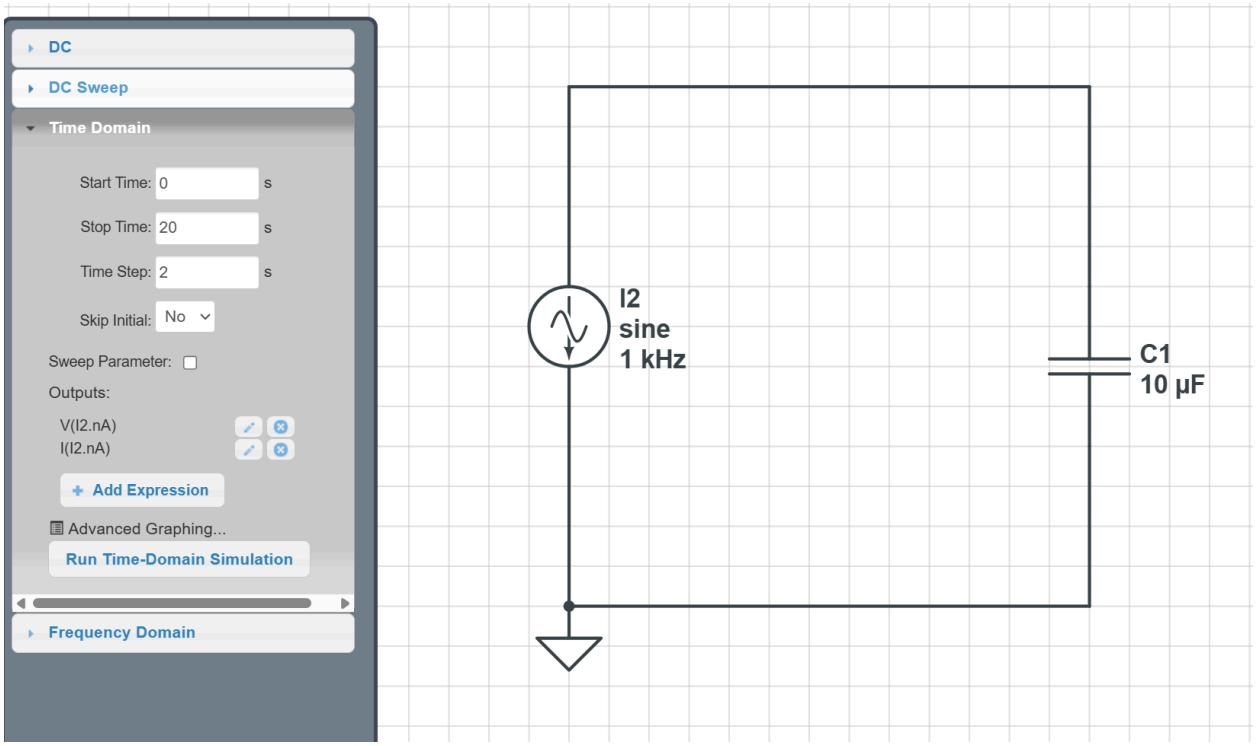


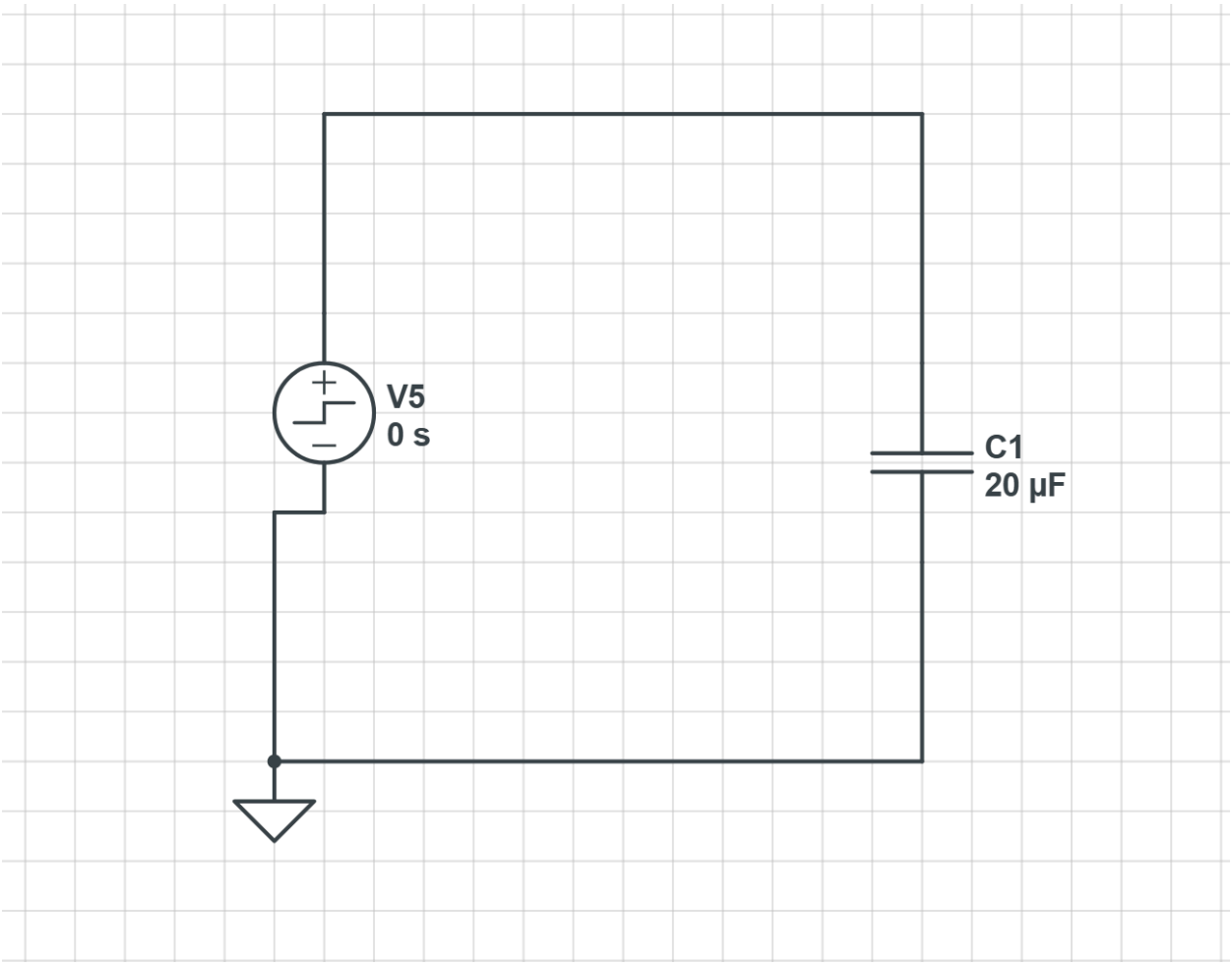
c. Use the DC sweep simulation tool to examine how the lightbulb power varies with the voltage of the batter (voltage source) and how it varies with the internal resistance of the lightbulb.

d. 

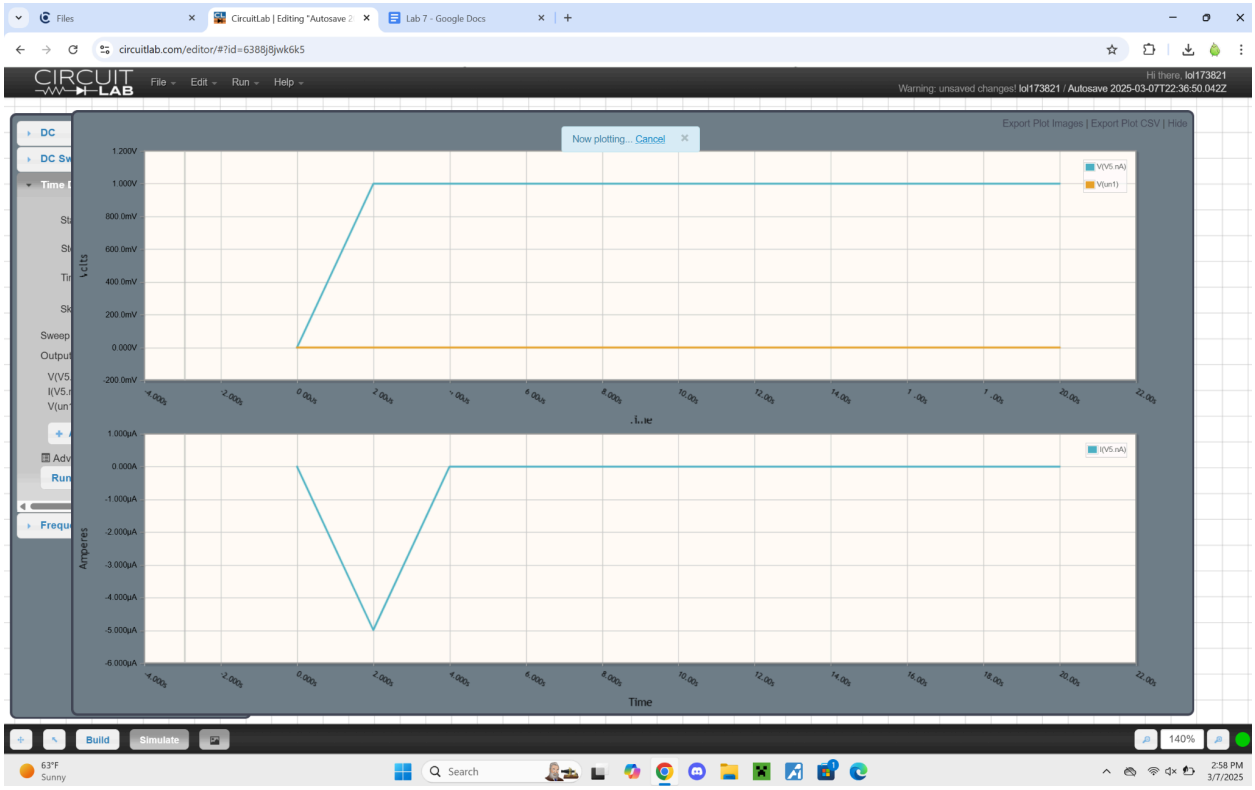
5. Capacitor circuit

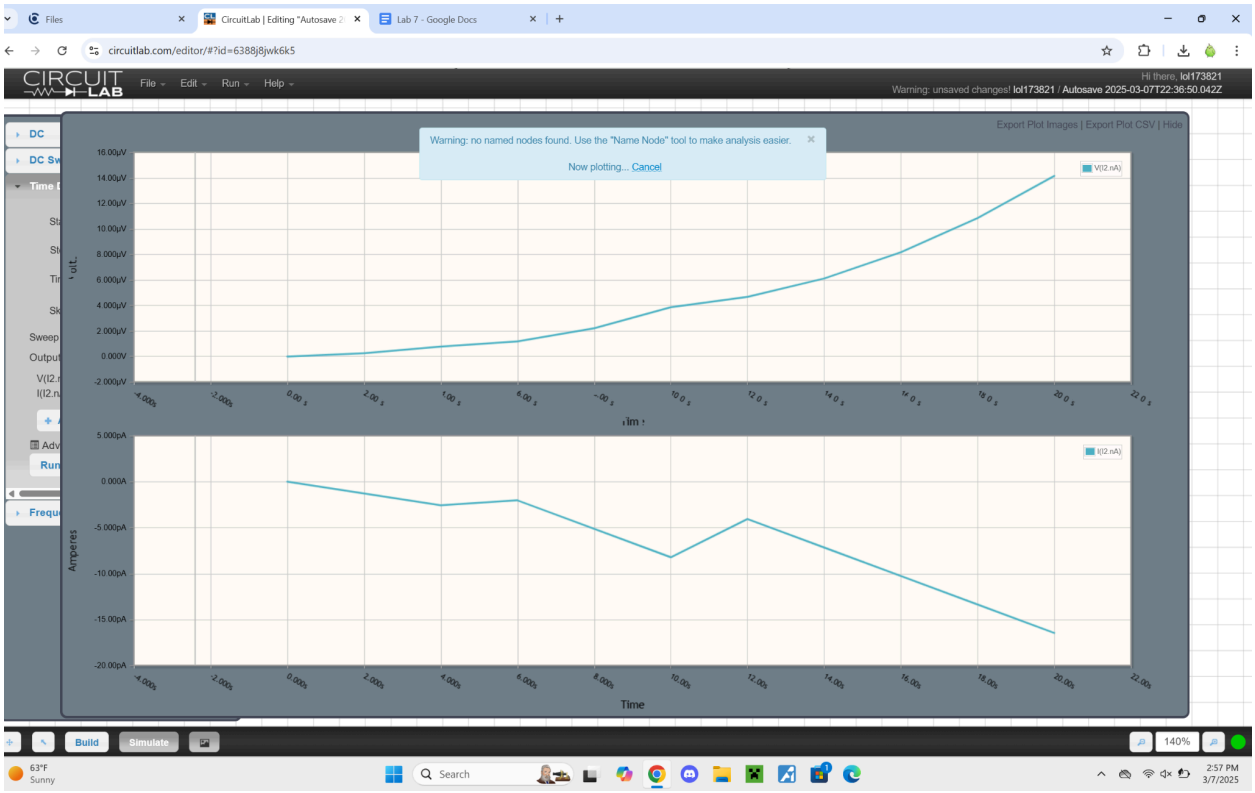
a. Build a circuit with a 10uF capacitor connected to a varying 1kHz current source (try both sine and step sources).




V5
0 s
C1
20 µF

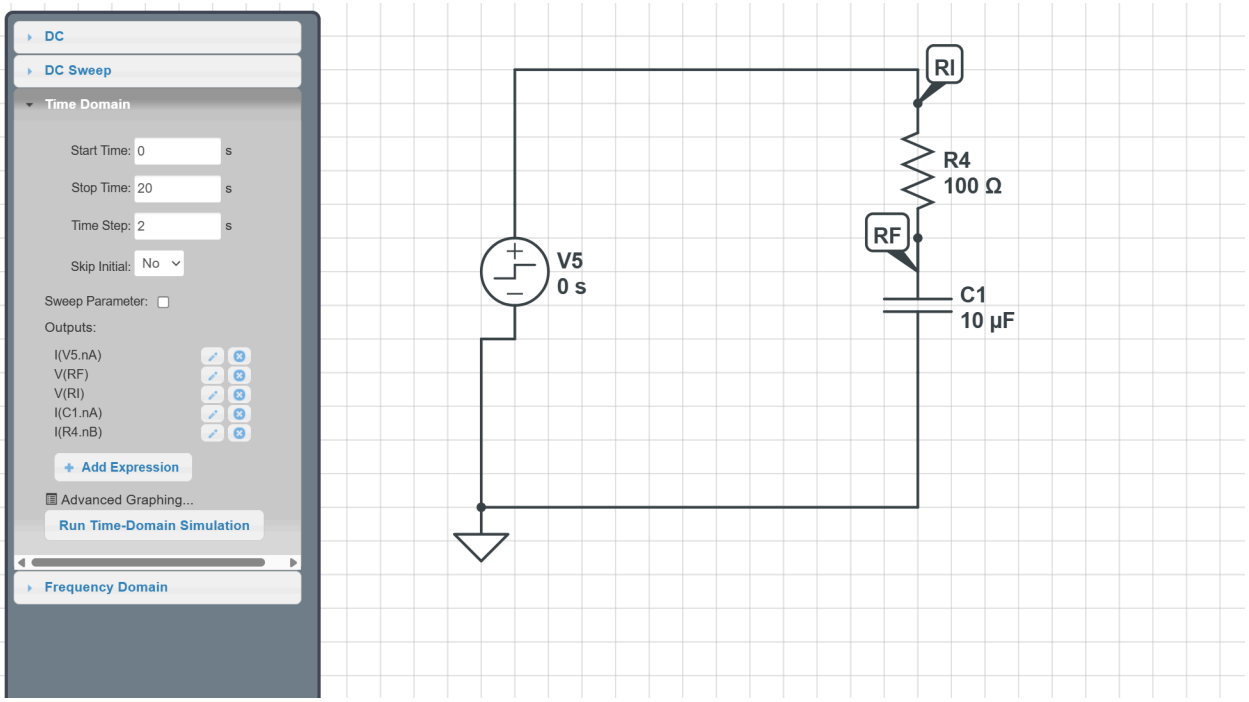
b. Use the time sweep simulation tool to examine how the voltage and current in the system varies over time. Try a few values for the capacitor.



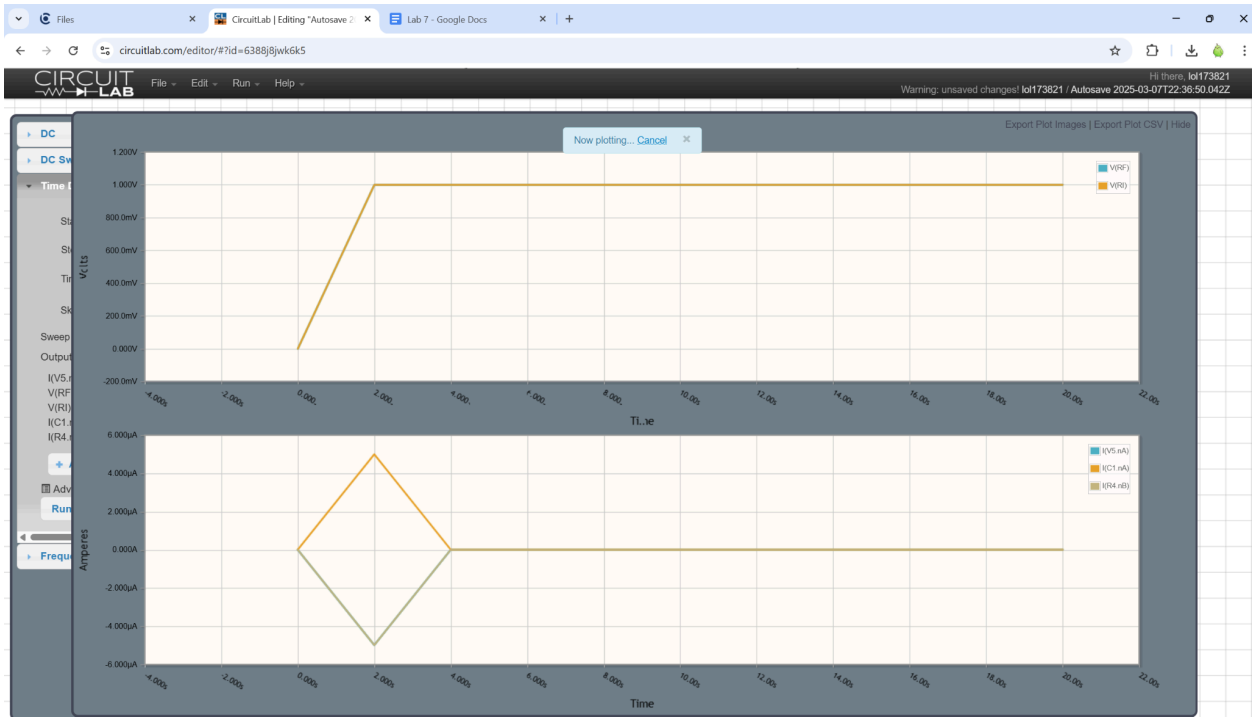


6. RC circuit

a. Build a simple RC circuit with a step function voltage supply, a 100 Ohm resistor and 10uF capacitor. Add voltage in and out nodes on either side of the resistor.

b. 

c. Us the time domain simulator to examine how the voltage and current change over time



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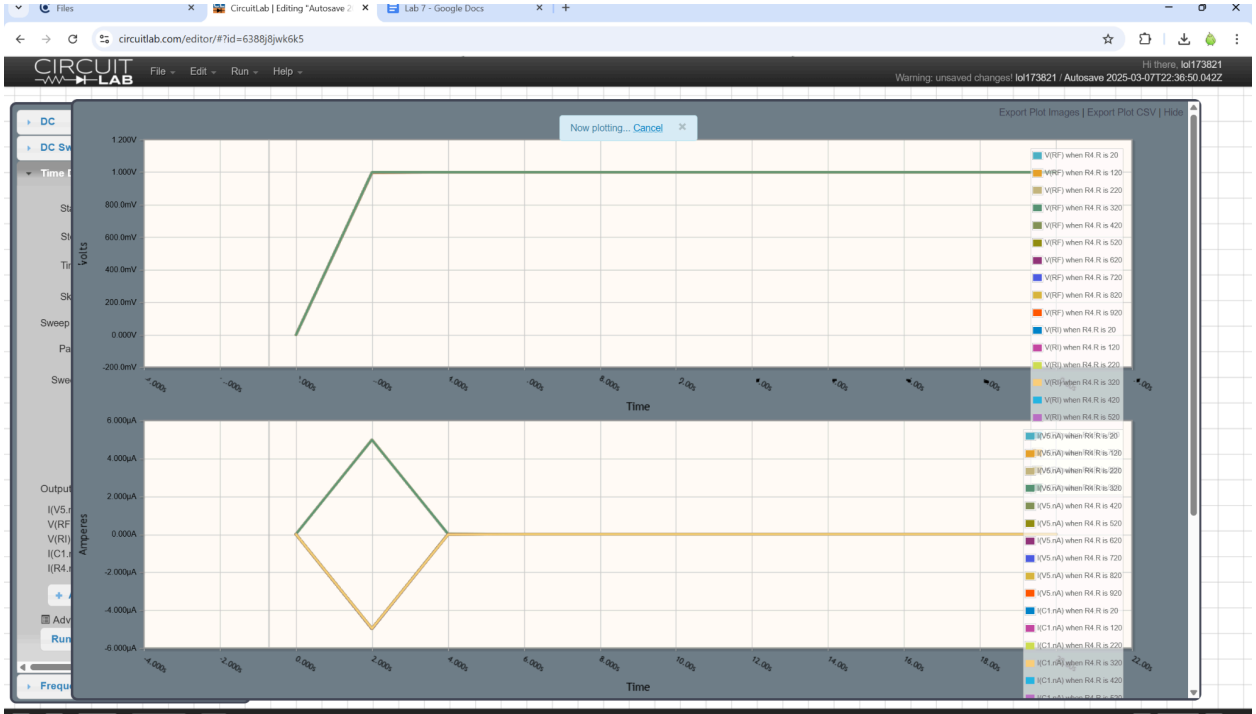
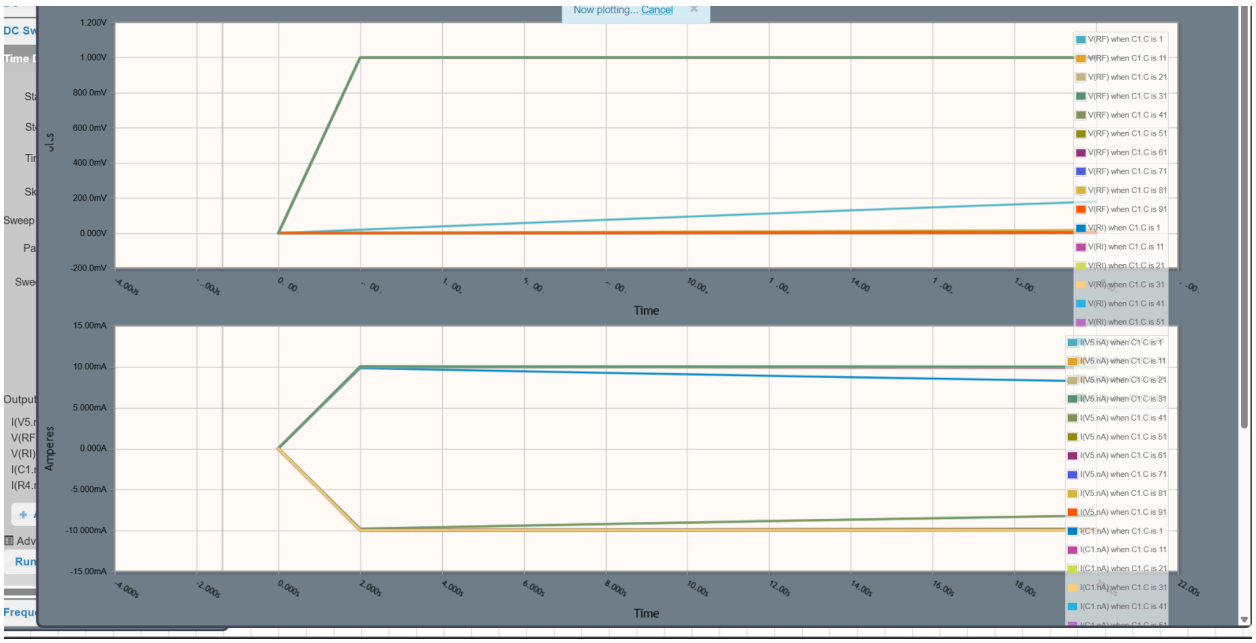
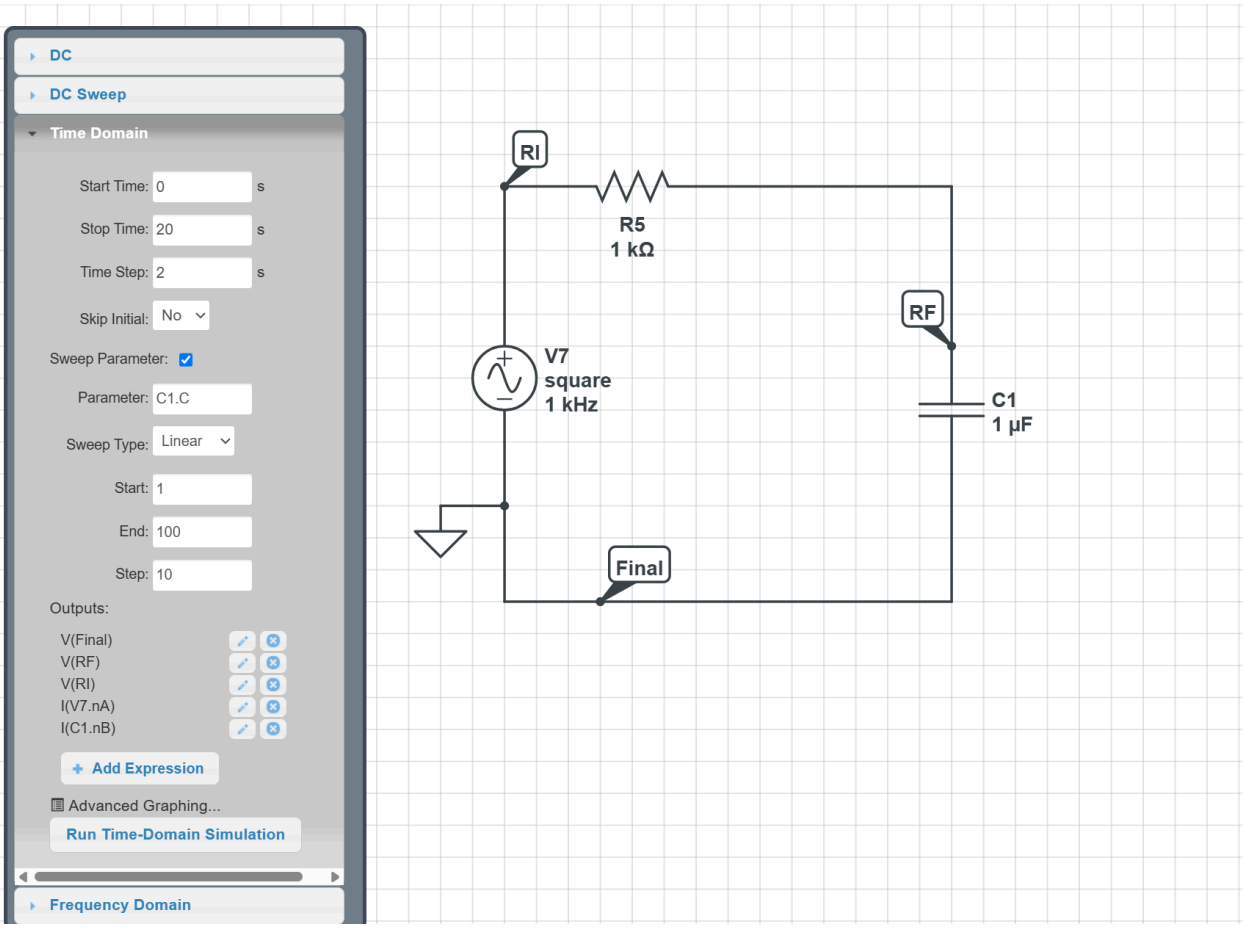
d. Explore how the time dependence of the system changes as you vary the resistance and capacitance in the system.



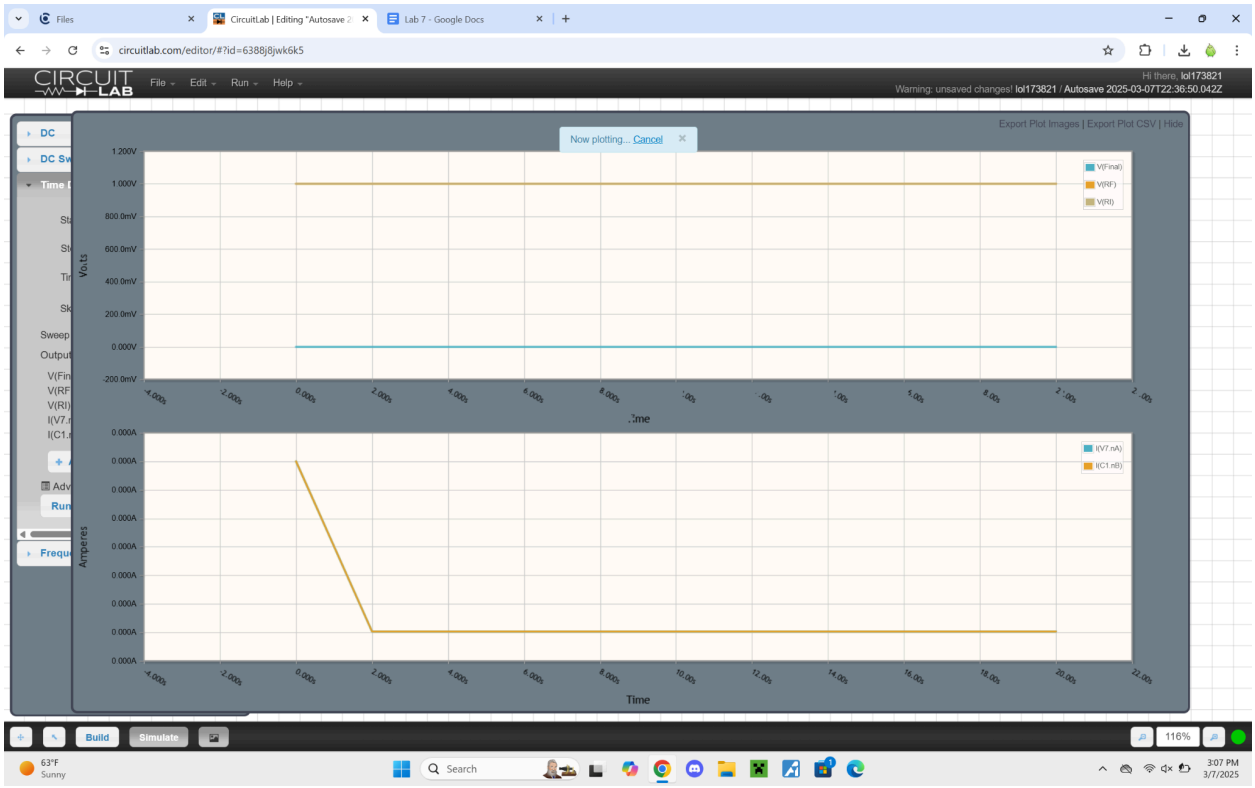


7. RC filter
    a. Build a circuit with an oscillating square wave (this is a parameter you can set) voltage supply, initially with a 100 Hz frequency. Include a 1kO resistor and a 1uF capacitor. Add nodes to examine the input and output voltage.

b. 

c. Use the time domain simulator to examine how changes to the resistance (and/or capacitance) effects the output voltage. Try out difference input voltage frequencies.

d.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V(RF)
V(RI)
I(V7:nA)
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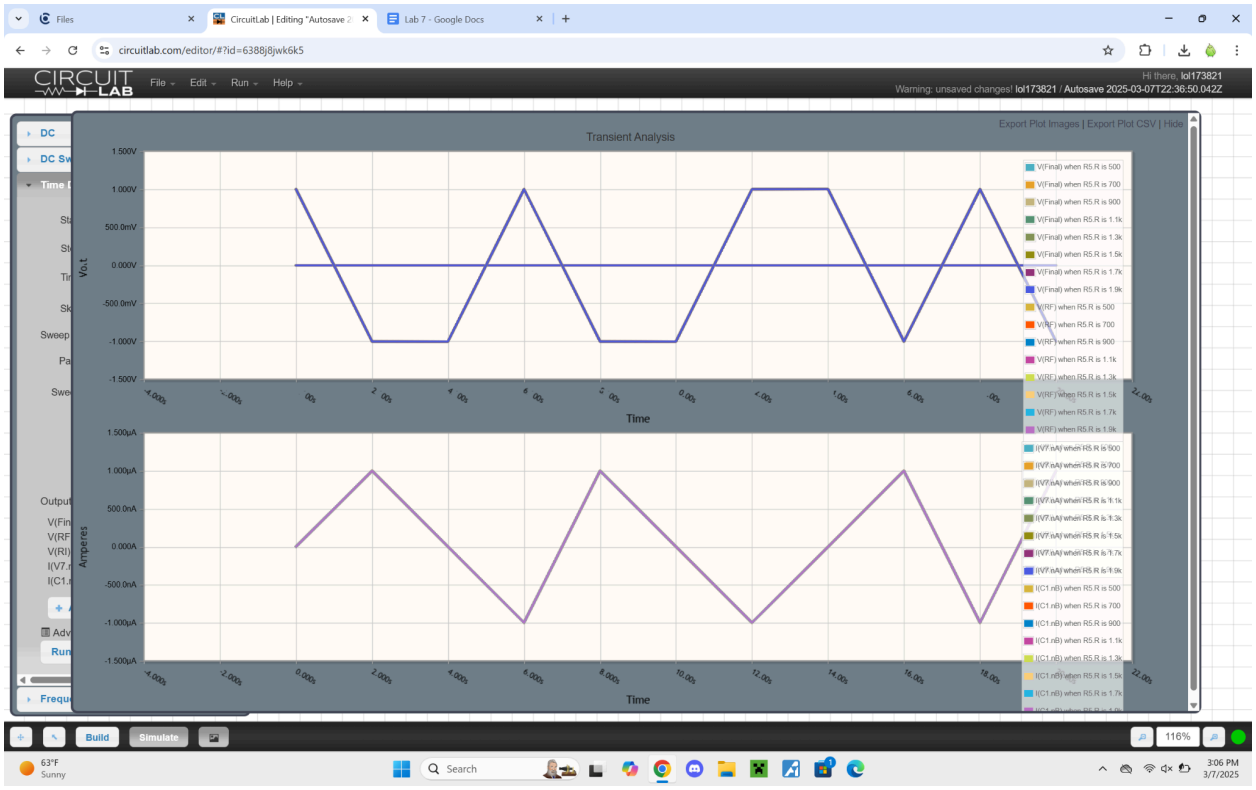
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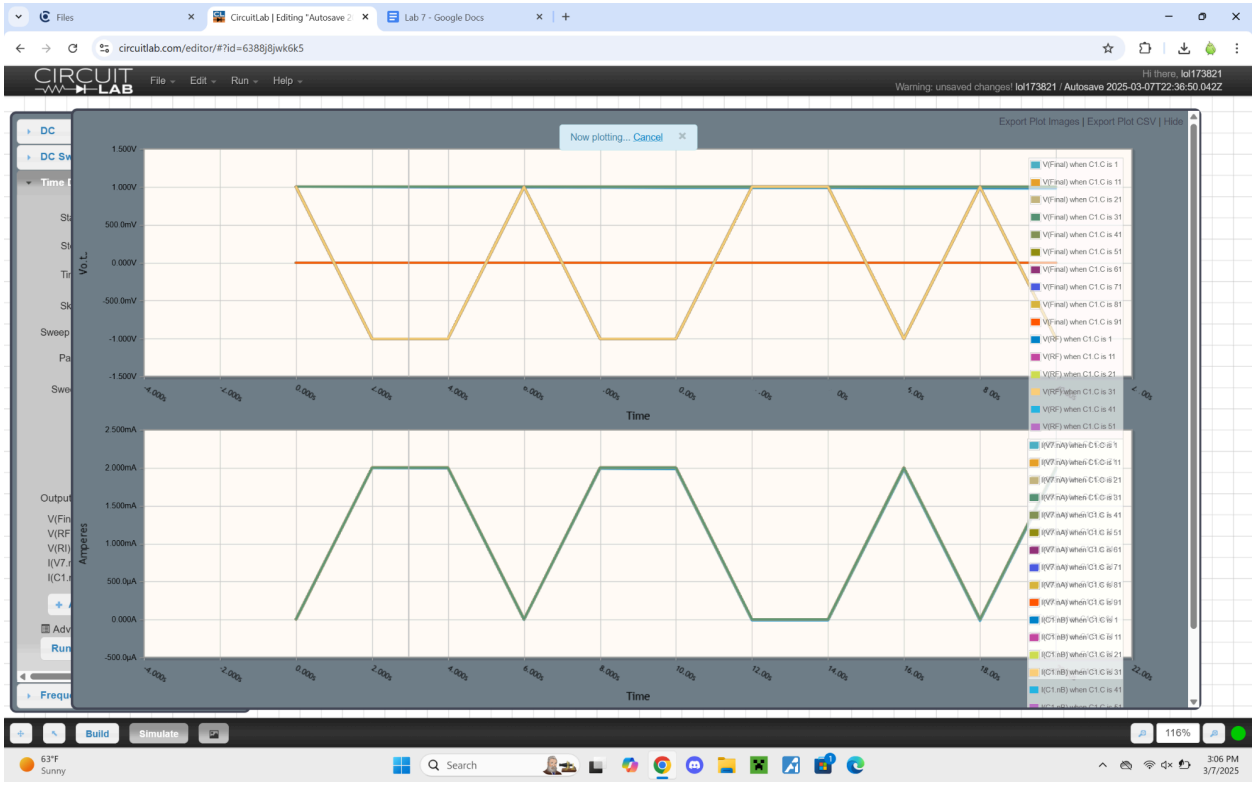
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