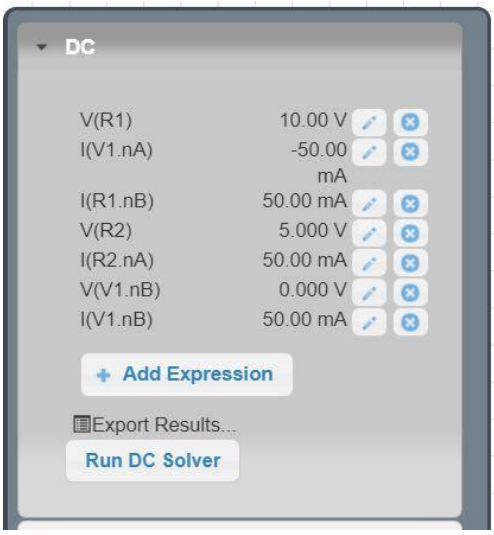
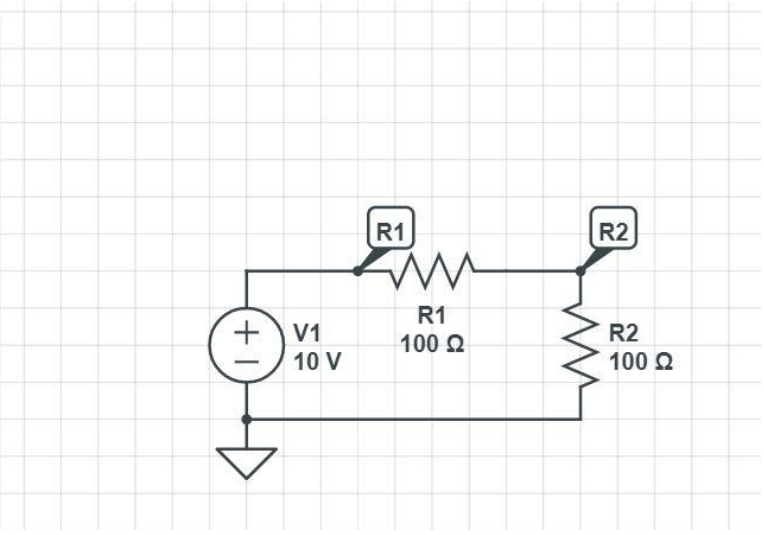
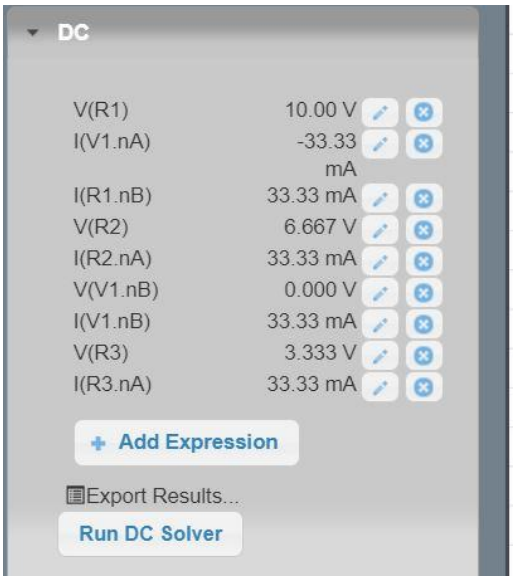
Week 7 Lab - Marley, Adi, & Marc

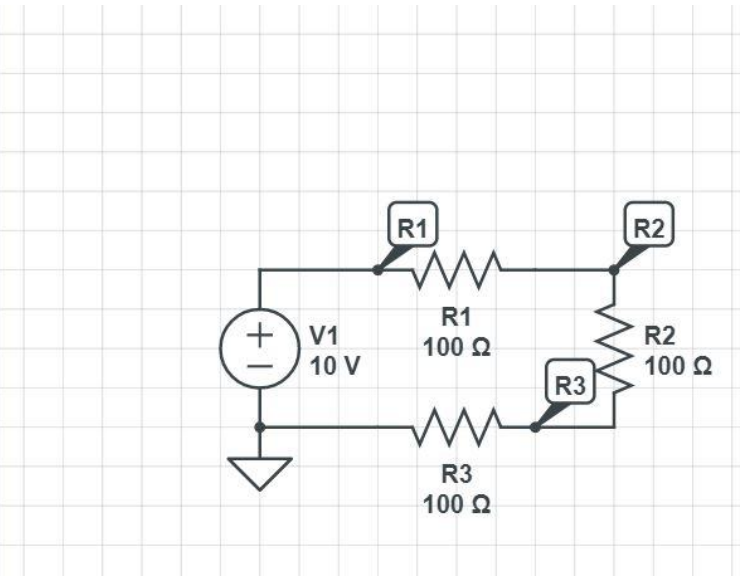
1.





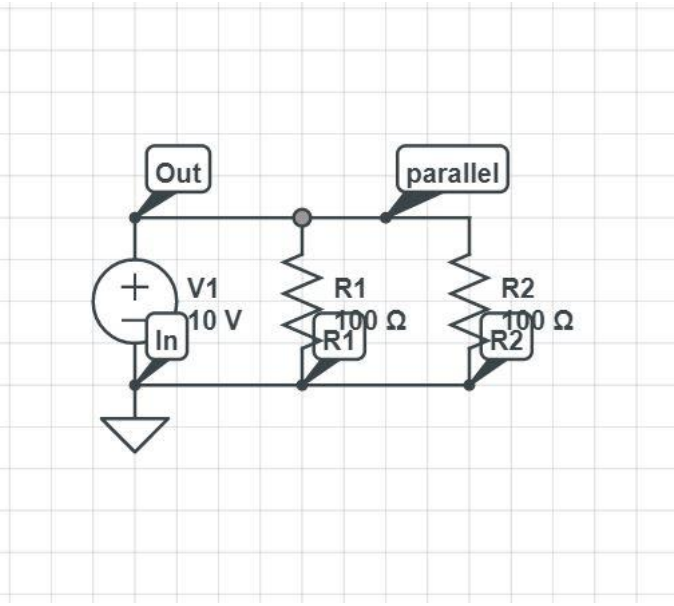
With 2 resistors in series we can observe a voltage of ½ (5V) across resistors.



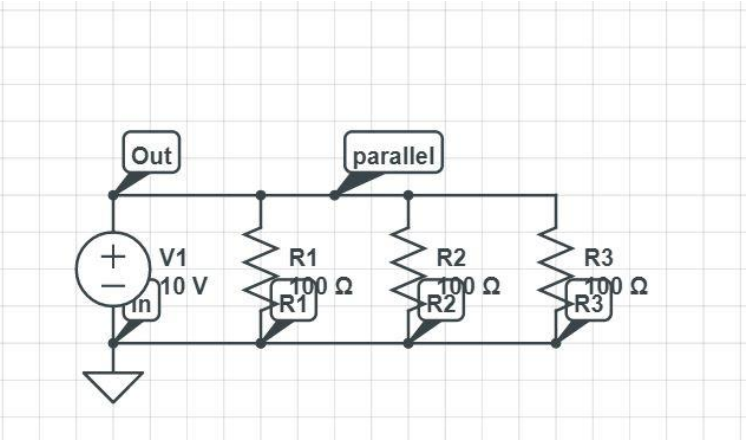


Similarly with 3 resistors in series we see a voltage drop of ⅓ (3.333V) across resistors.

2.

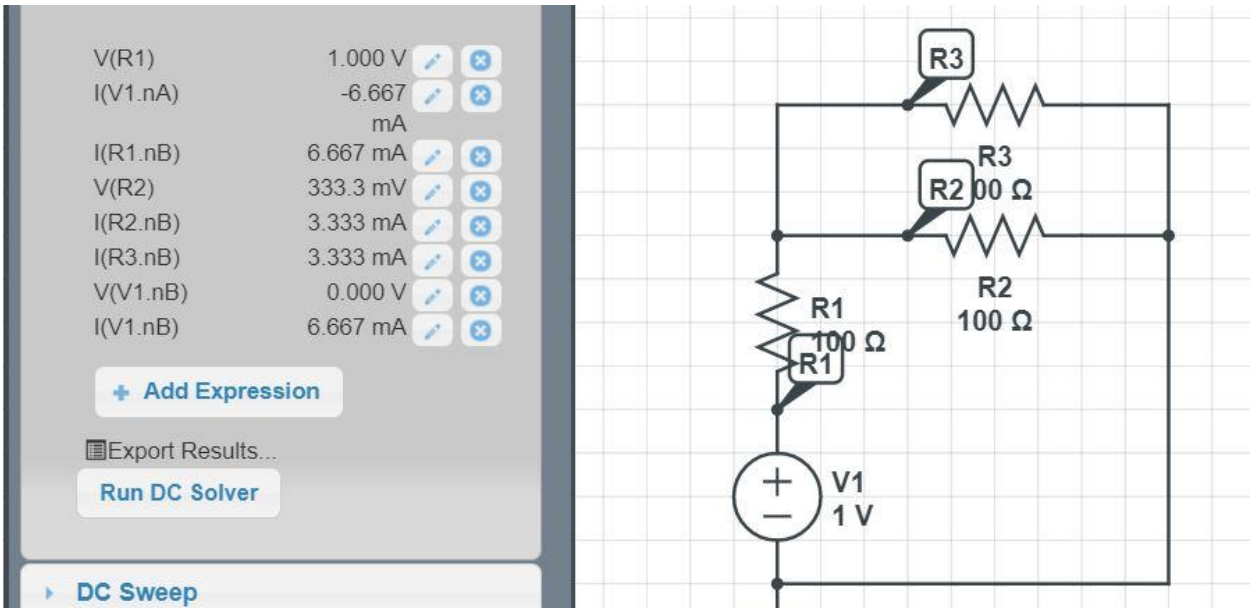


With resistors in series we see a complete voltage drop across both branches, with each resistor pulling 100mA each.



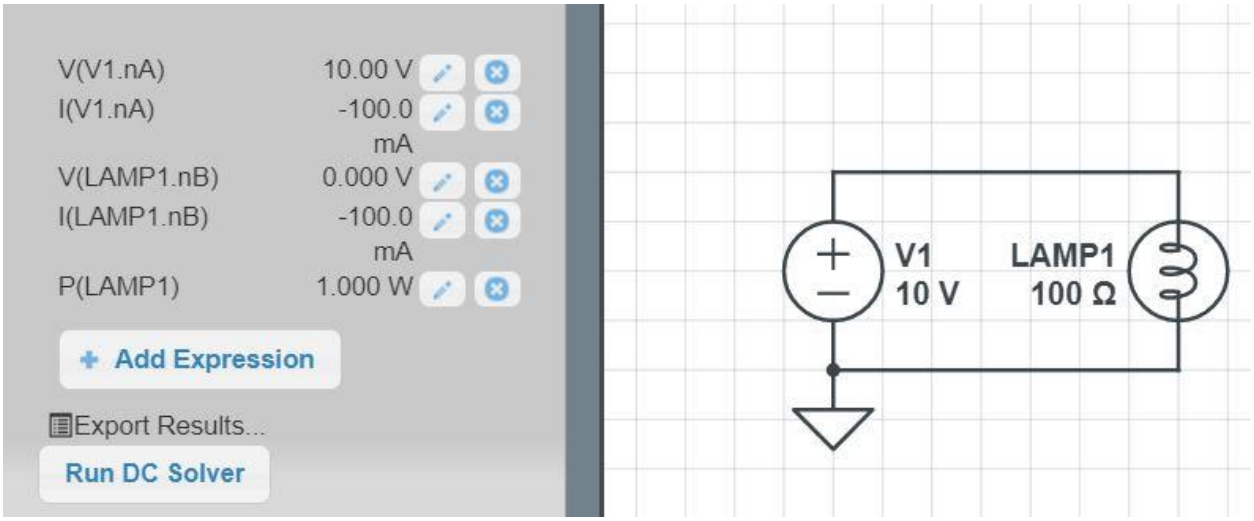
Like before we only observe a complete voltage drop across all 3 branches, from 10V to 0V, with each resistor drawing 100mA, because they're 100 ohms.

3.

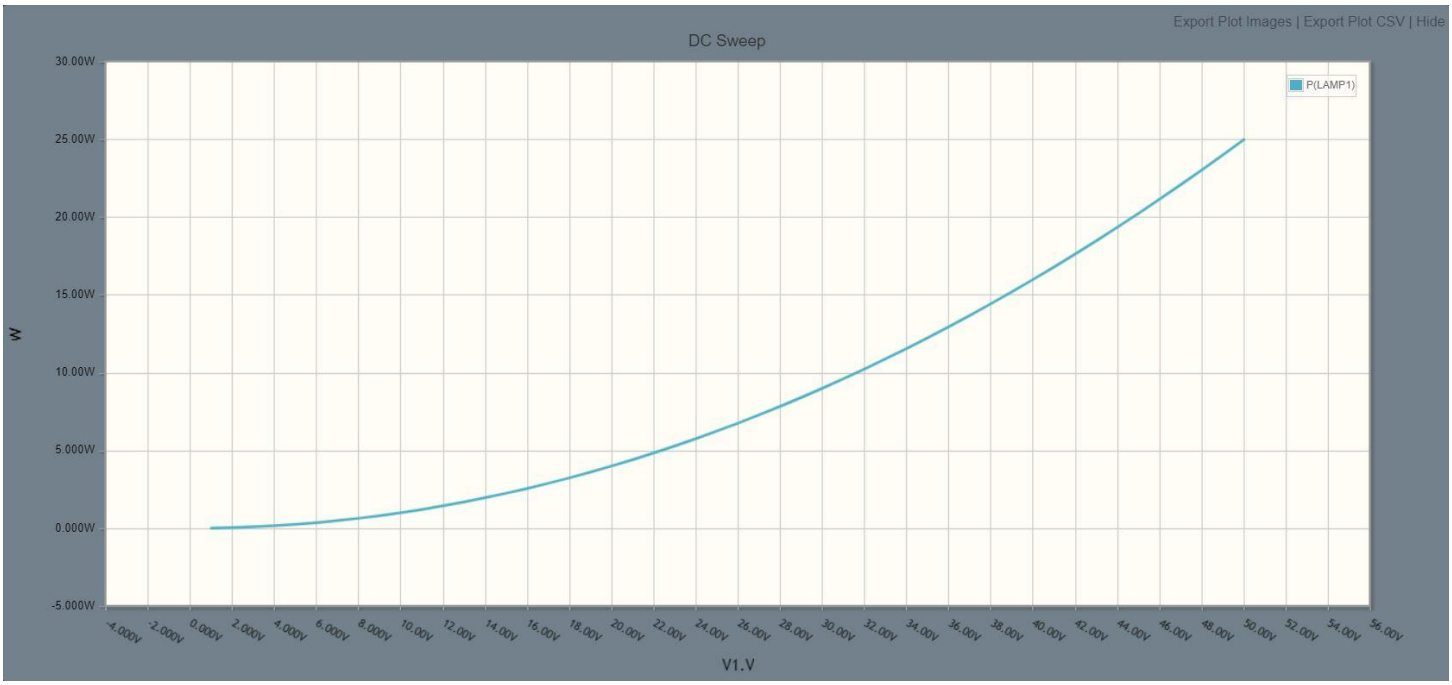


We can see the circuit draws a total of 6.667mA, with all of that passing through the first resistor (R1) in series, and then getting split across the following resistors (R2 and R3) in parallel, at 3.33mA each. Each resistor creates a voltage drop of 1/3 (3.33V)
Therefore, we can see that R1 and R2+R3 act like two resistors in series.

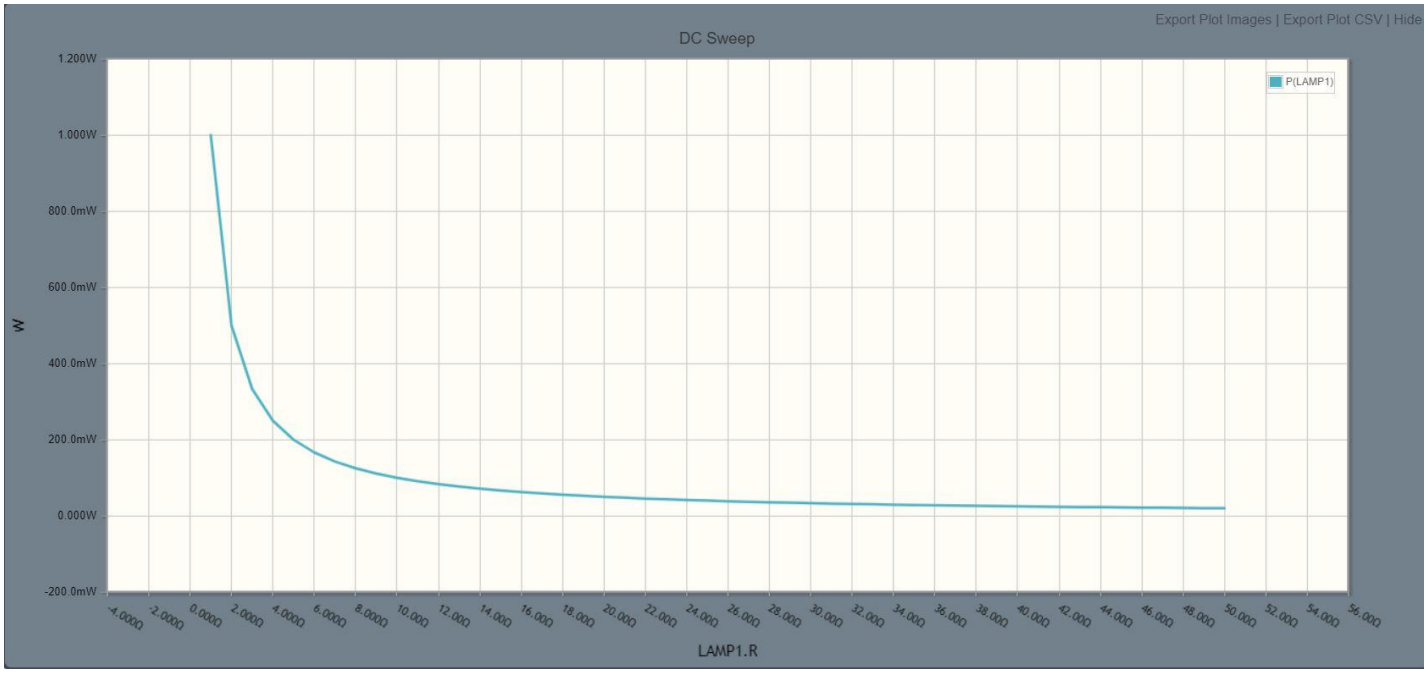
4.



We can see P = V^2/R being validated as the bulb draws 1 watt [(10V)^2/100ohm], this is proved by the DC Solver.

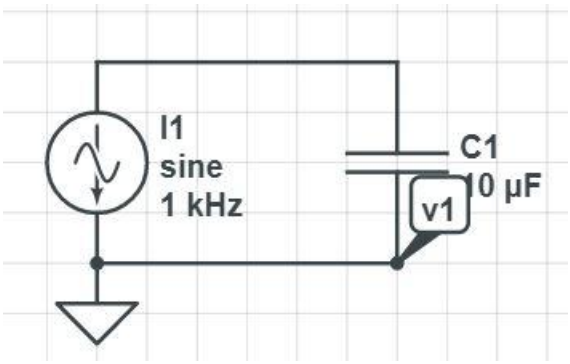


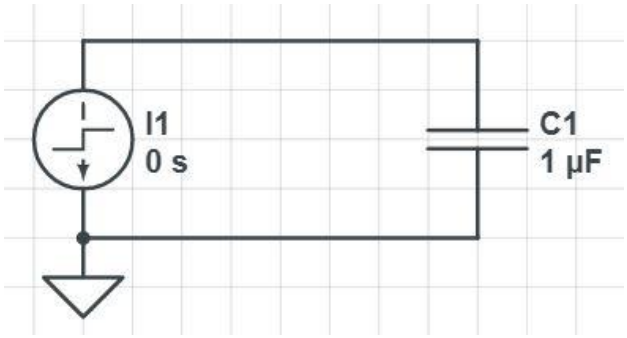
By varying the input voltage in the DC Sweep we observe the expected increasing exponential relationship between Power and Voltage.

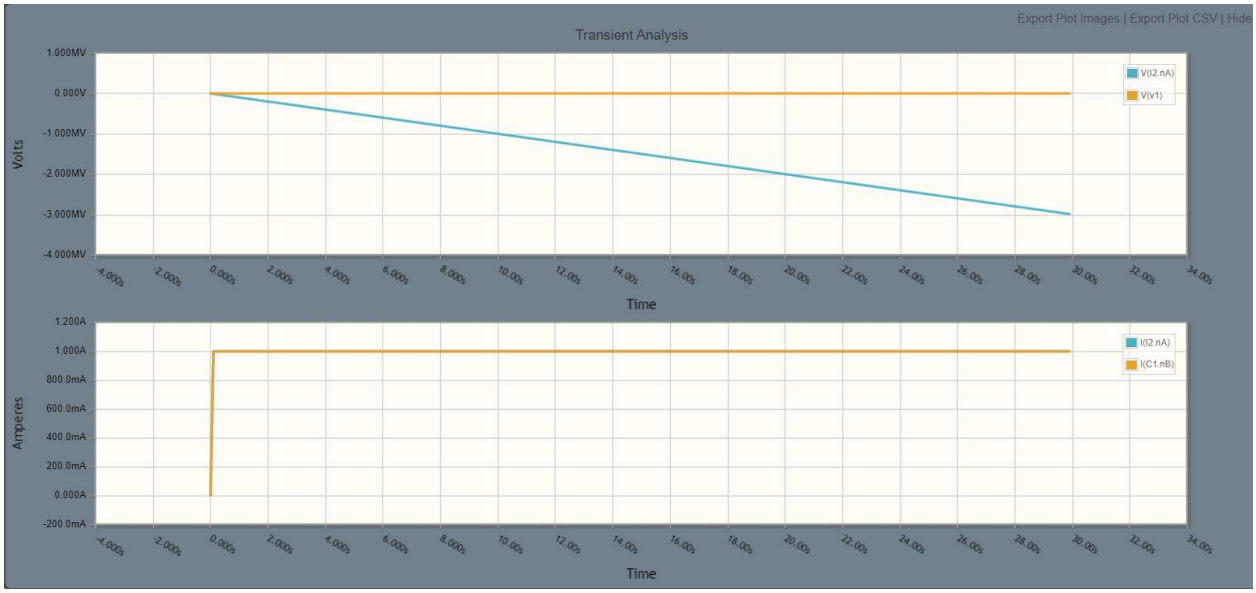


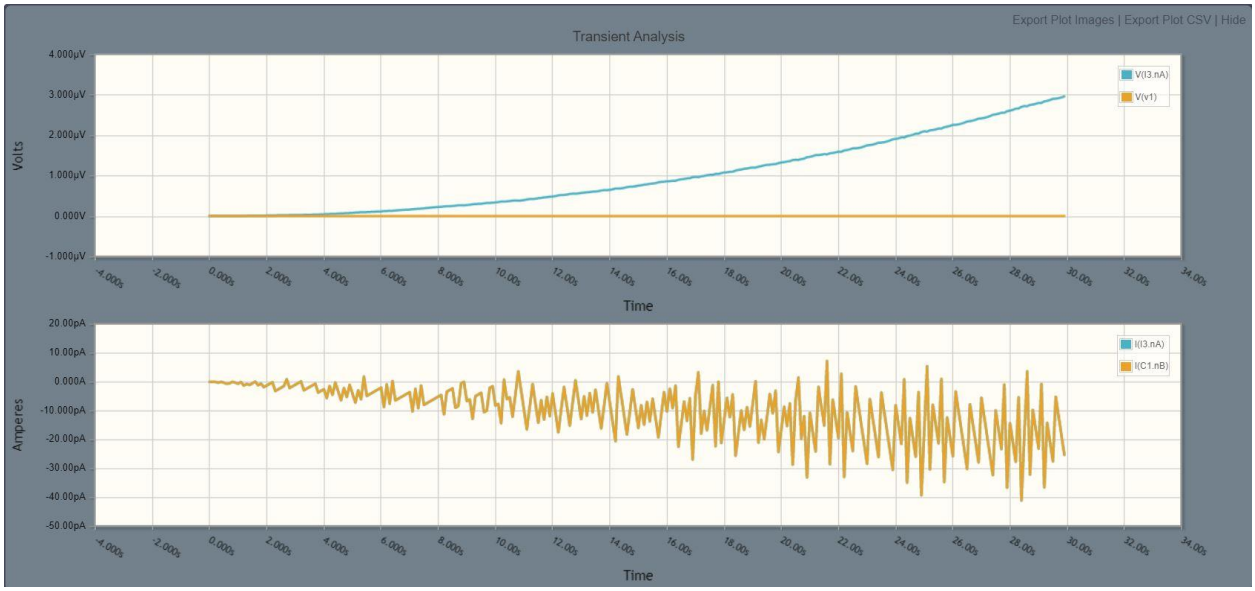
And similarly, by varying and increasing the lightbulb's resistance we see an exponential decay in the power, approaching the limit of 0 watts.

5.

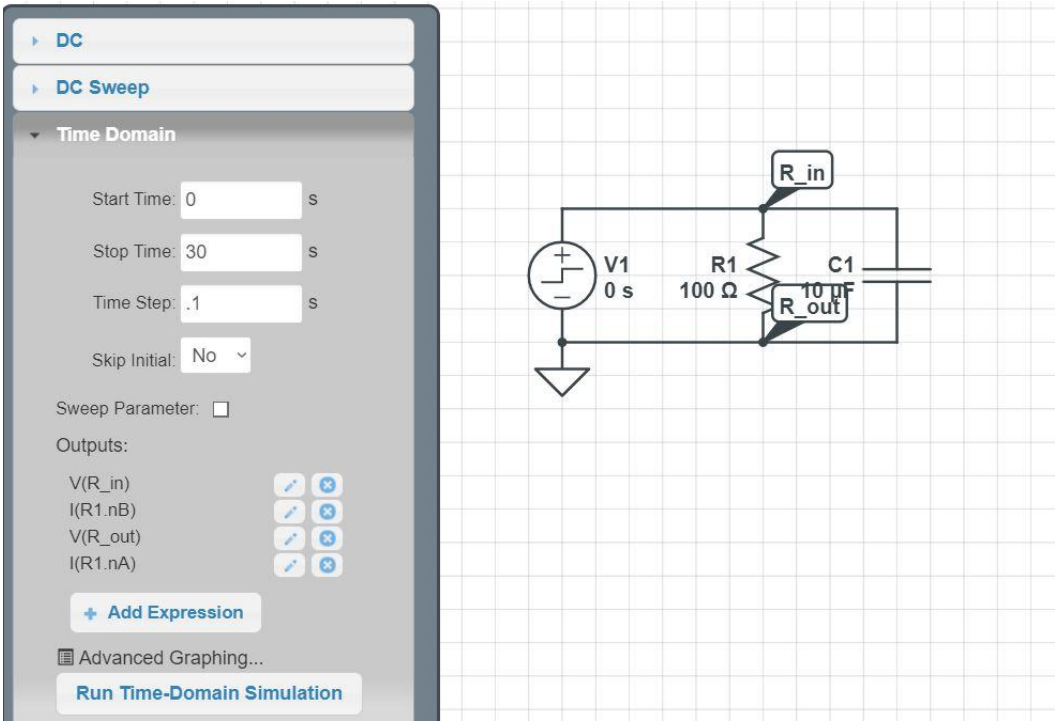

I1
sine
1 kHz
C1
10 µF
v1

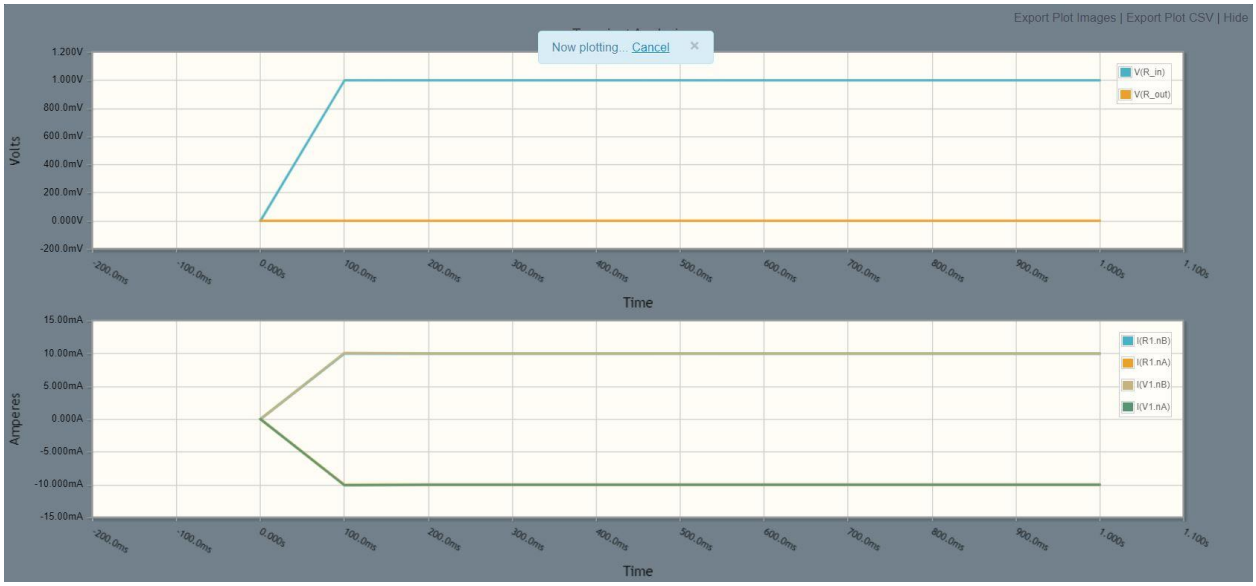

I1
0 s
C1
1 µF


Export Plot Images | Export Plot CSV | Hide
Transient Analysis
Volts
Time
V(I2.nA)
V(v1)
Amperes
I(I2.nA)
I(C1.nB)

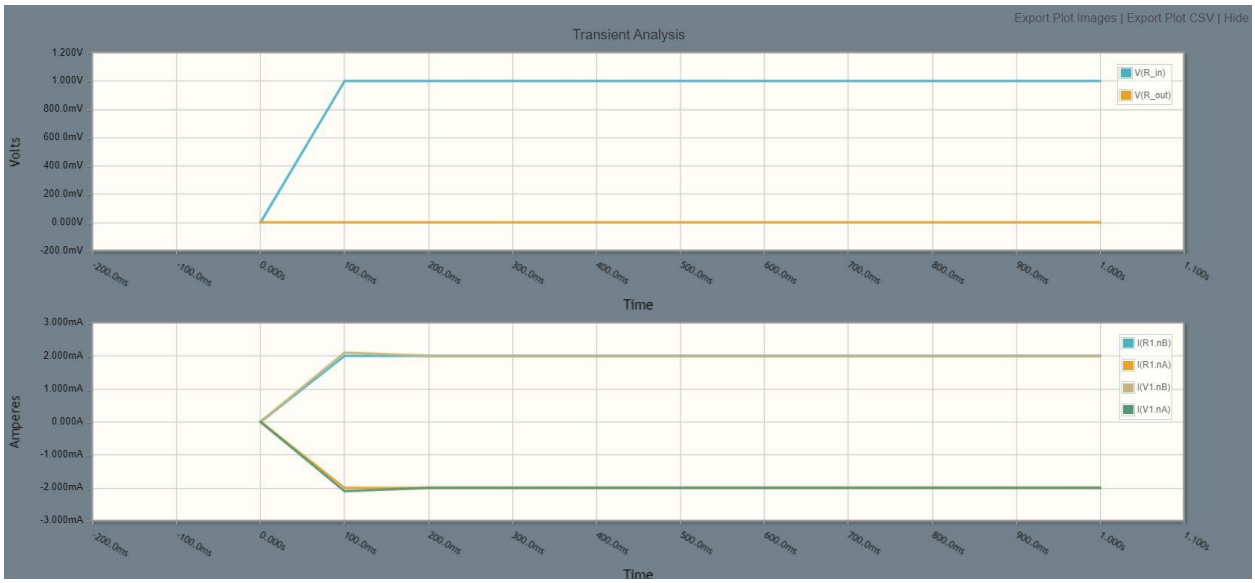

Export Plot Images | Export Plot CSV | Hide
Transient Analysis
Volts
Time
V(I3.nA)
V(v1)
Amperes
I(I3.nA)
I(C1.nB)

6.

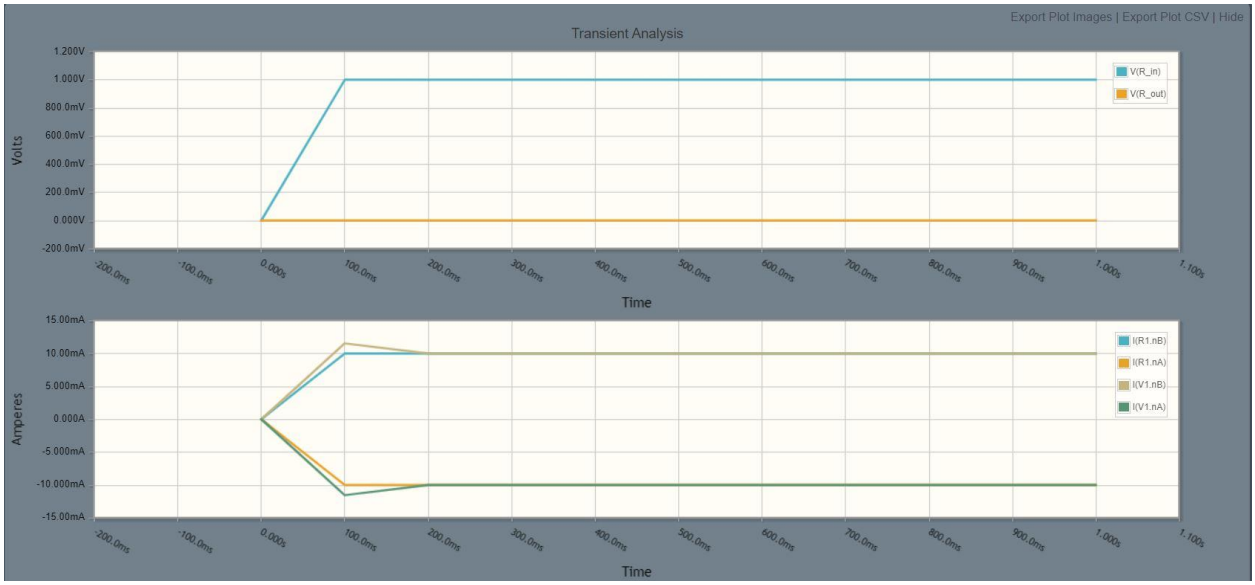




With R=100 ohms, C=10 uF

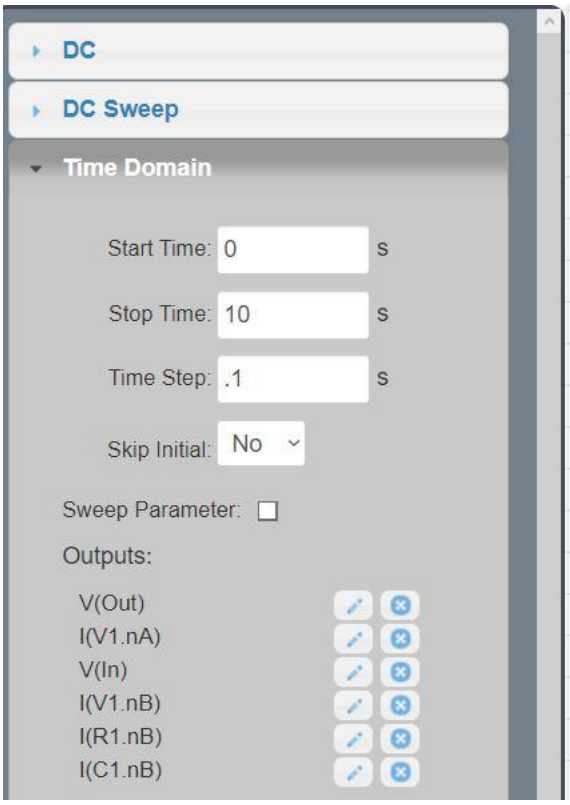


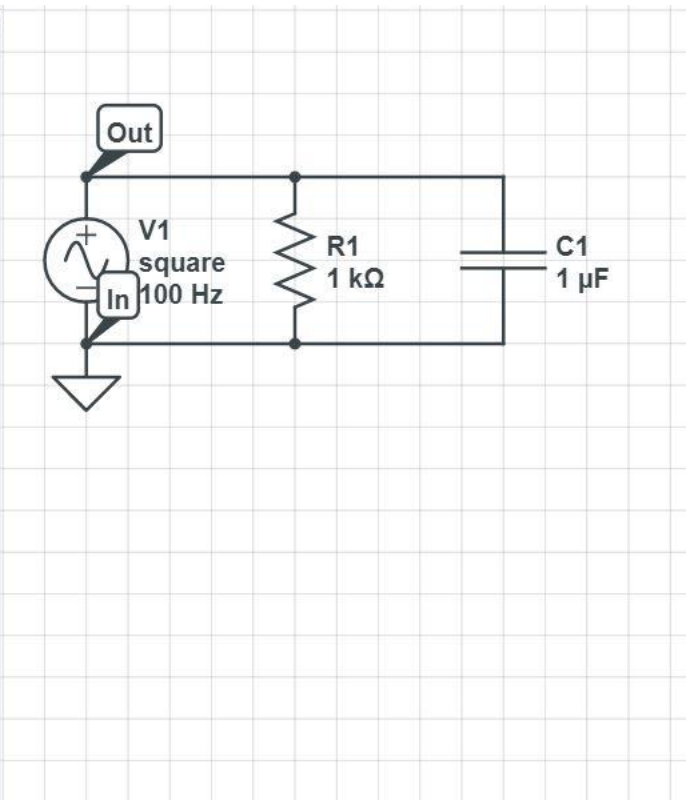
With R = 500 ohm and C = 10 uF

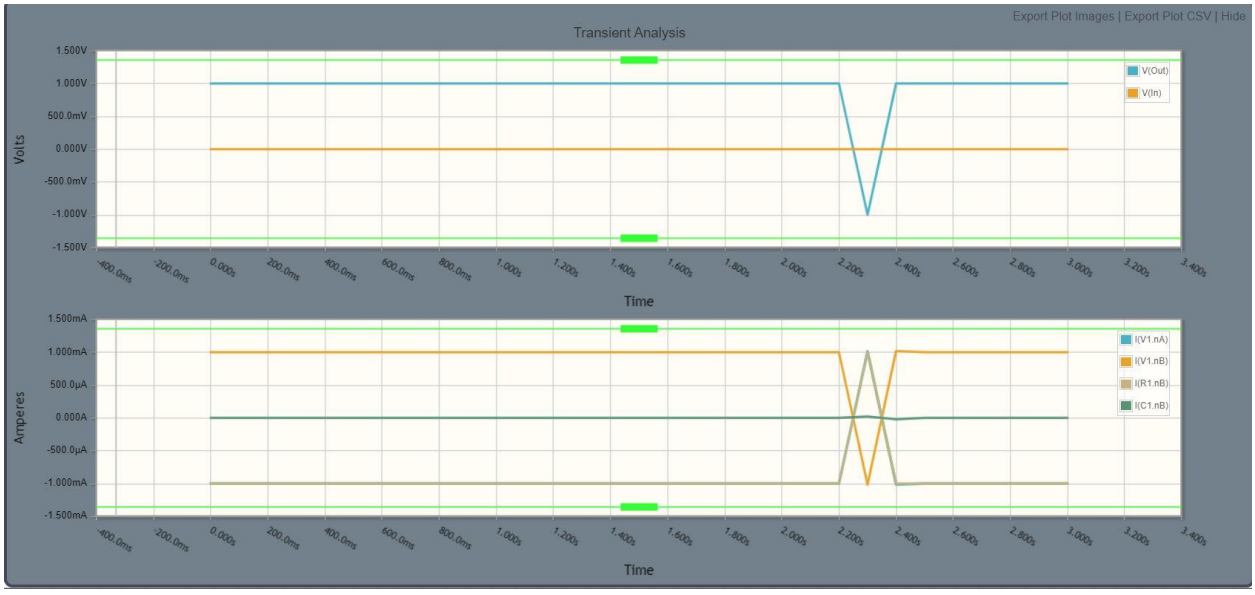


With R = 100 ohms, C = 155 uF

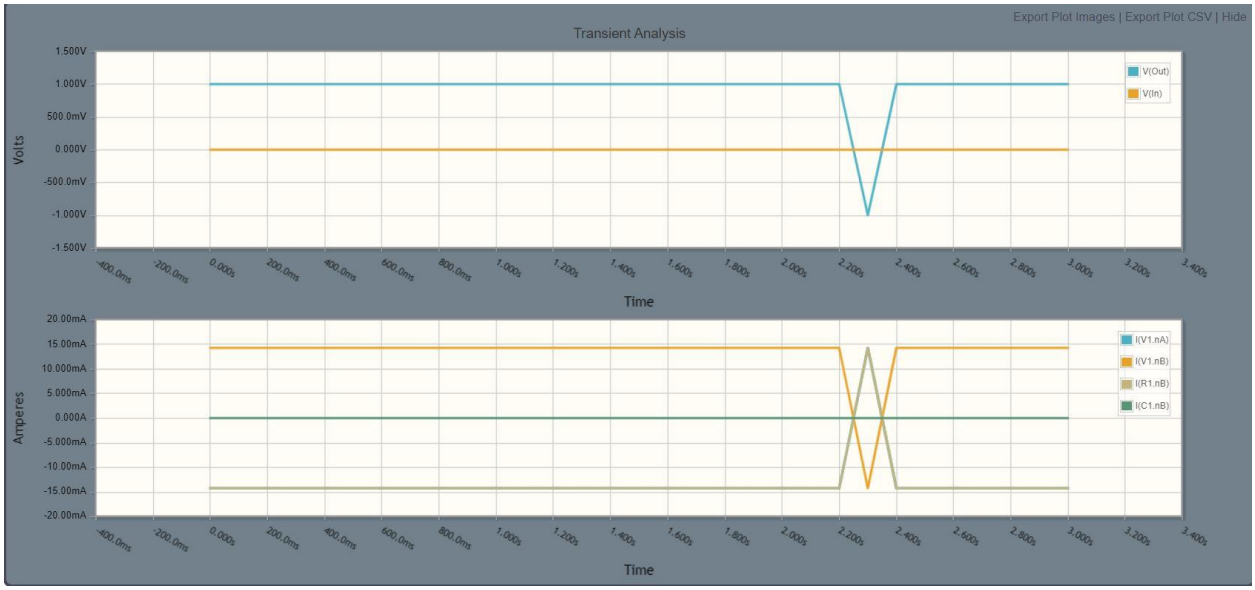
7.





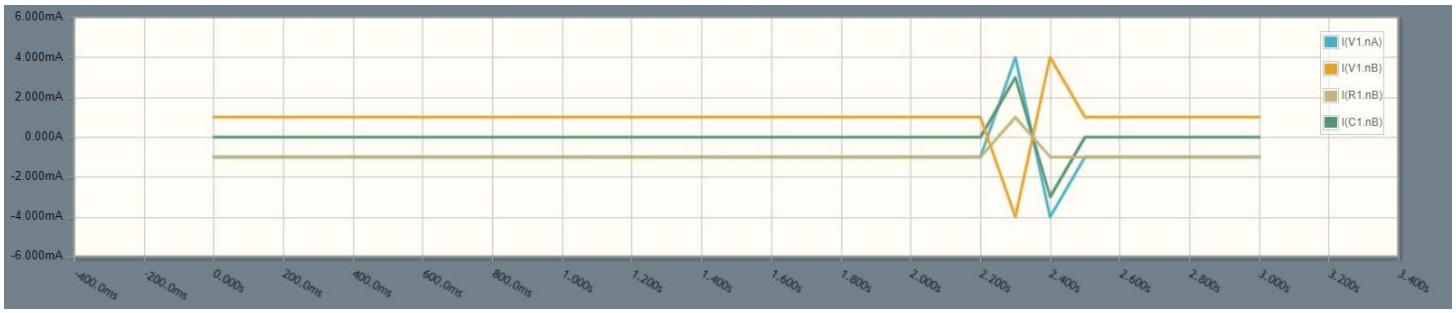


With: f = 100 Hz, R = 1000 ohm, C = 1 uF

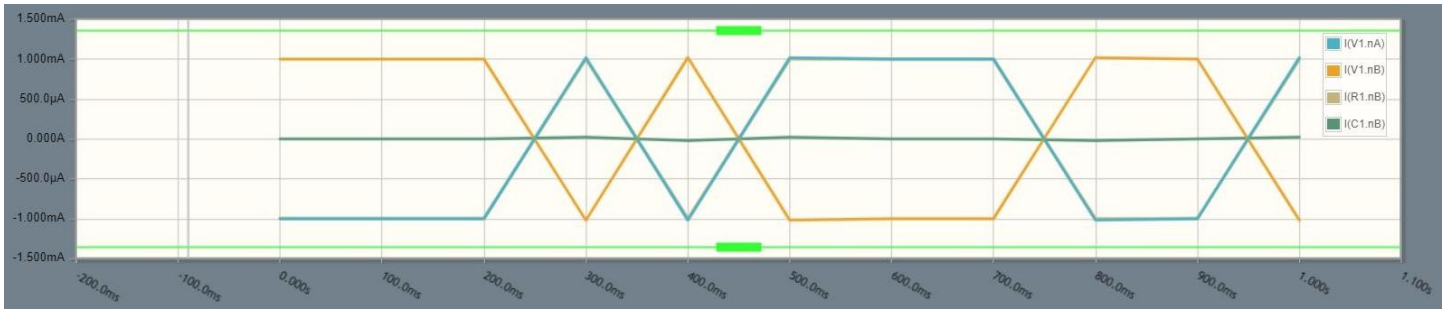


With: f = 100 Hz, R = 70 ohm, C = 1 uF
Relationship is the exact same as before even with 7% of the original resistance.

With: f = 100 Hz, R = 5000 ohm, C = 1 uF
Here we see the much larger resistance, 5x, start to destabilize the relationship between it and voltage.



With: f = 100 Hz, R = 5000 ohm, C = 150 uF



With: f = 1000 Hz, R = 5000 ohm, C = 1 uF