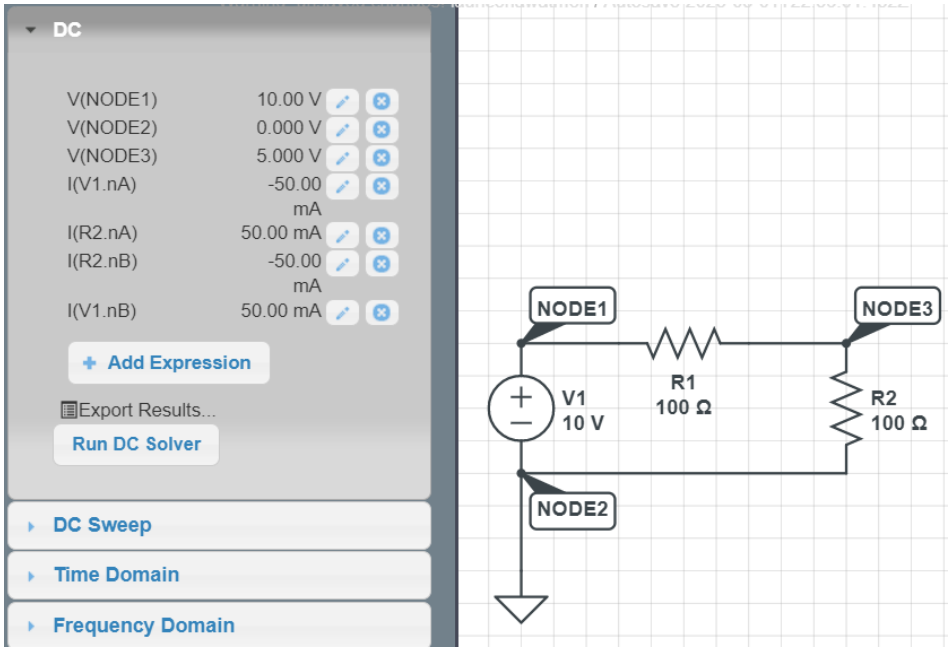
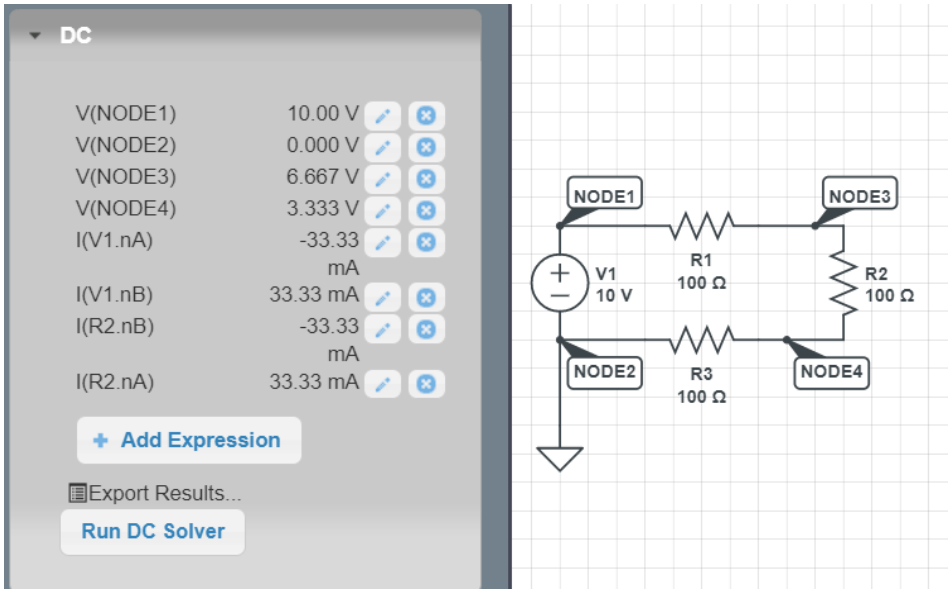
1c.

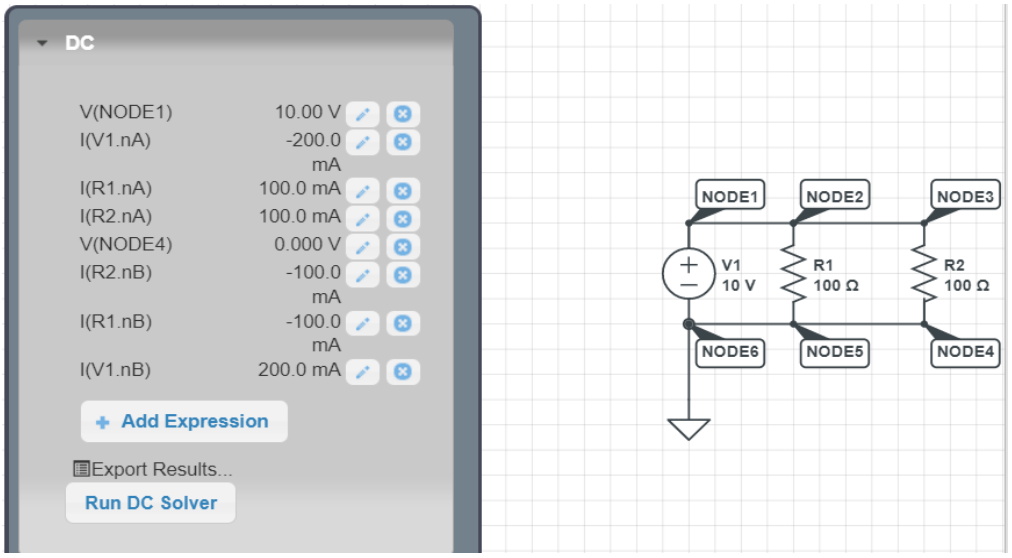


1d.

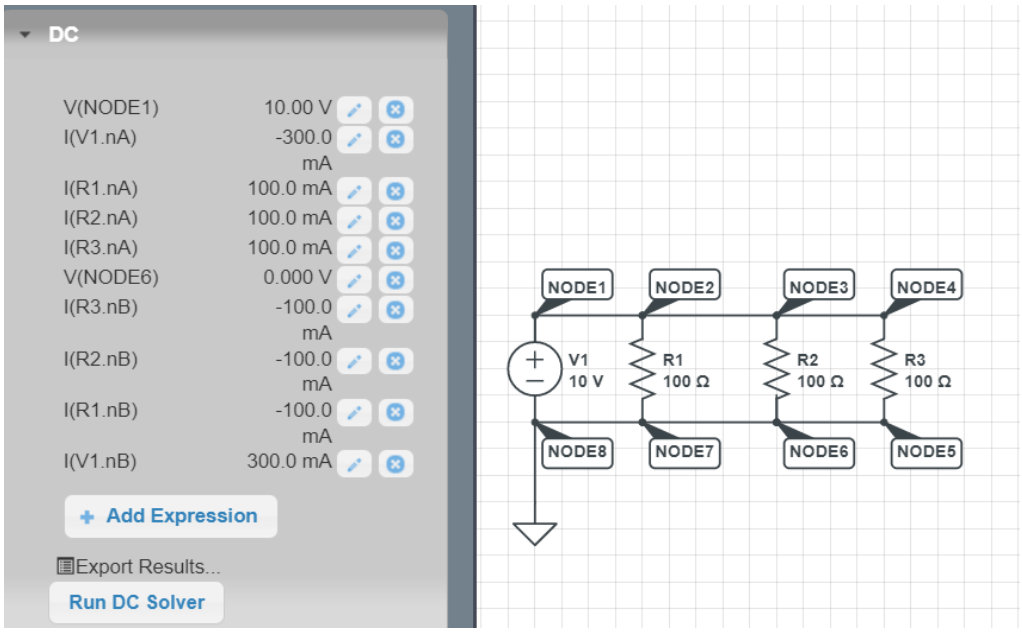


In a series circuit, the current through each of the components is the same, and the voltage across the circuit is the sum of the voltages across each component. In comparison to the case with two series resistors, adding a third series resistor reduces the amount of voltage flowing through each node and the overall current in the system.

2c.

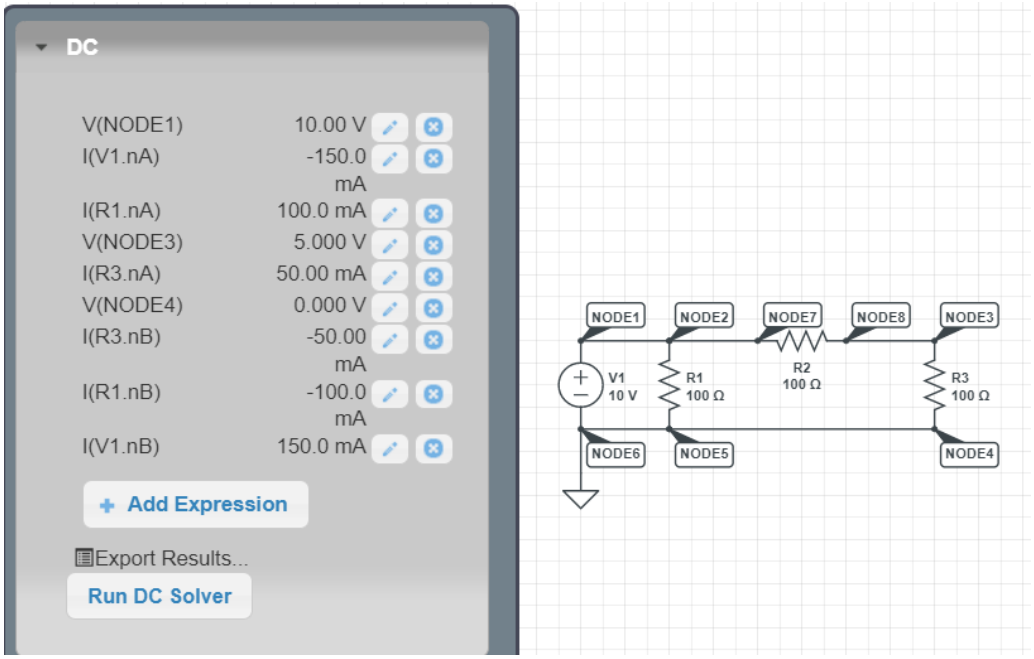


2d.



In a parallel circuit, the voltage across each of the components is the same, and the total current is the sum of the currents through each component. In comparison to the case with two parallel resistors, adding a third parallel resistor increases the current flowing into the voltage source while the voltage across each of the components stays the same.

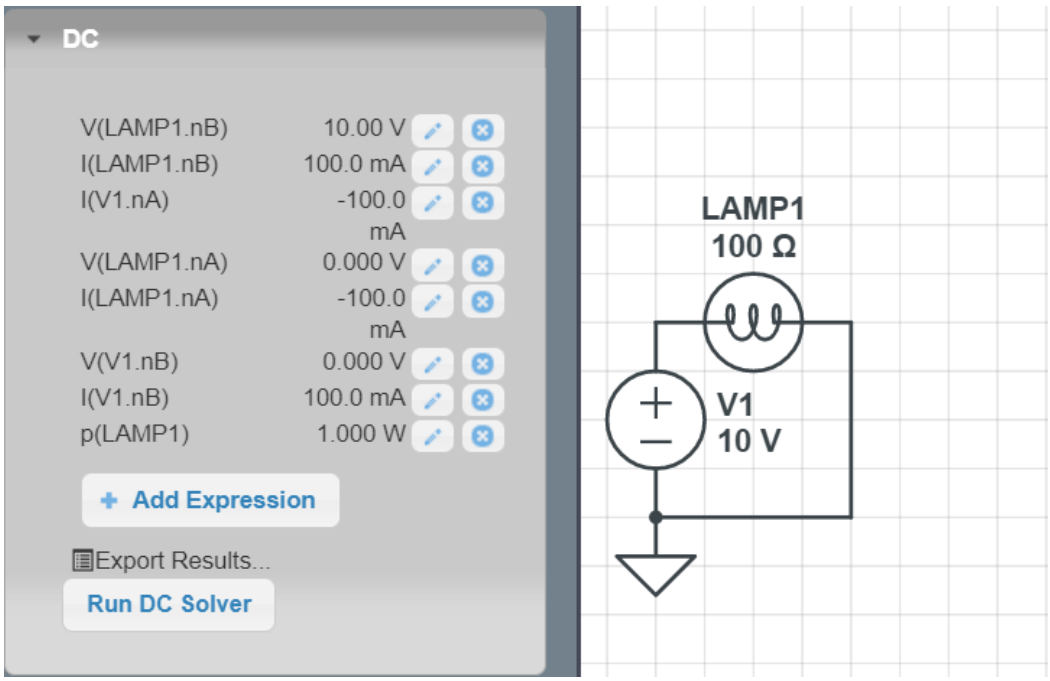
3c.



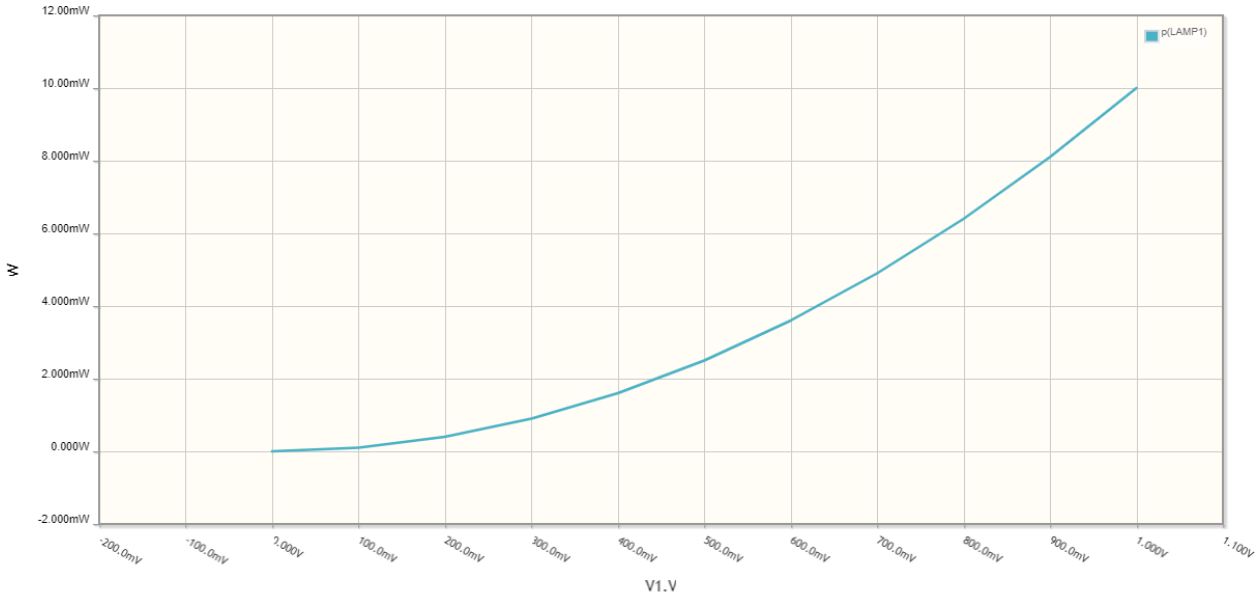
In the case of resistors only in series or only in parallel, either the current or voltage is constant. However, in the case of resistors in series and parallel, both the current and voltage are changing.

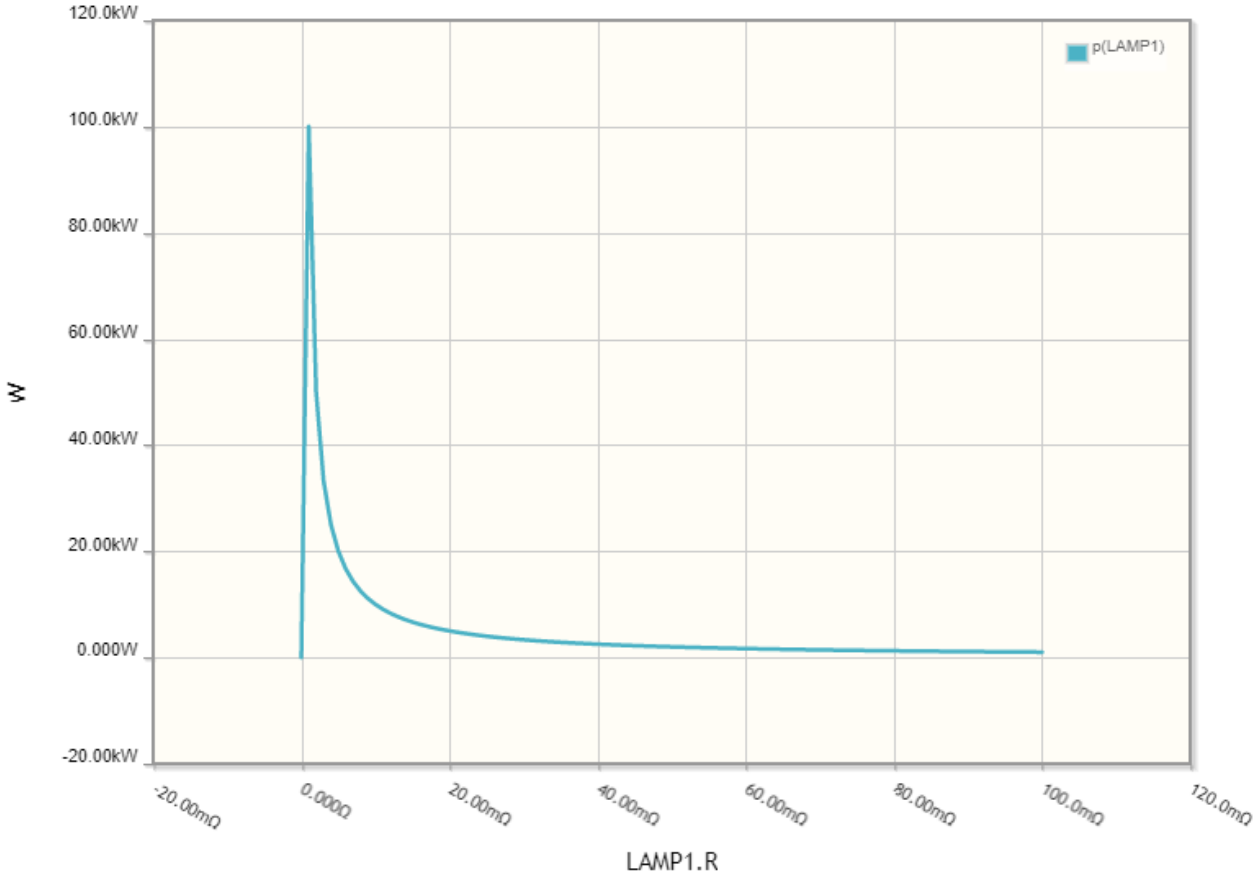
4a. P=V^2/I=10^2/100=1 W

4b.

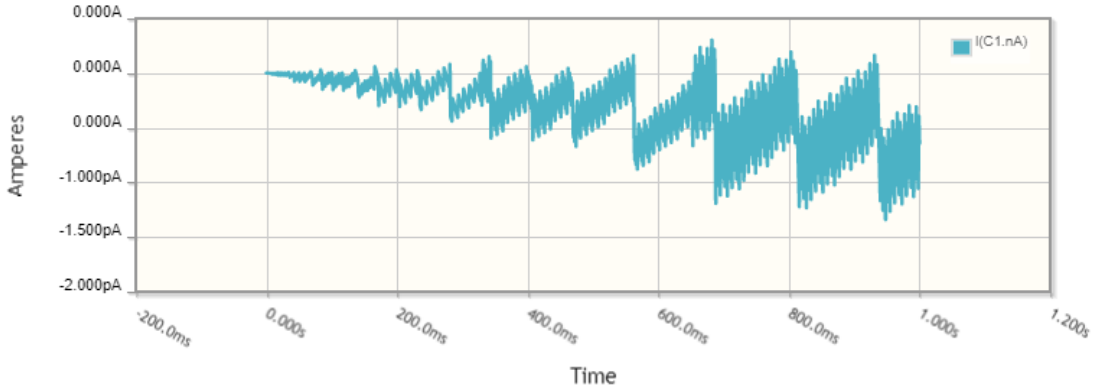


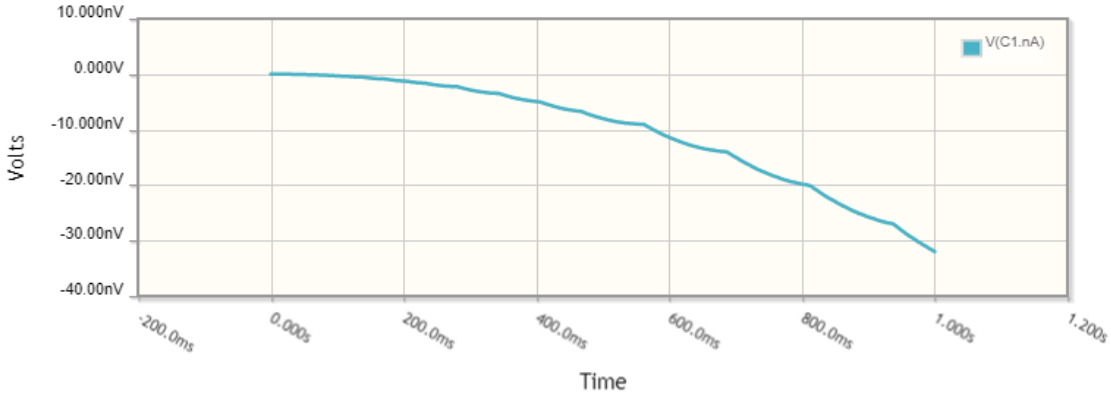
4c.


12.00mW
10.00mW
8.000mW
6.000mW
4.000mW
2.000mW
0.000W
-2.000mW
W
p(LAMP1)
-200.0mV
-100.0mV
0.000V
100.0mV
200.0mV
300.0mV
400.0mV
500.0mV
600.0mV
700.0mV
800.0mV
900.0mV
1.000V
1.100V
V1.V

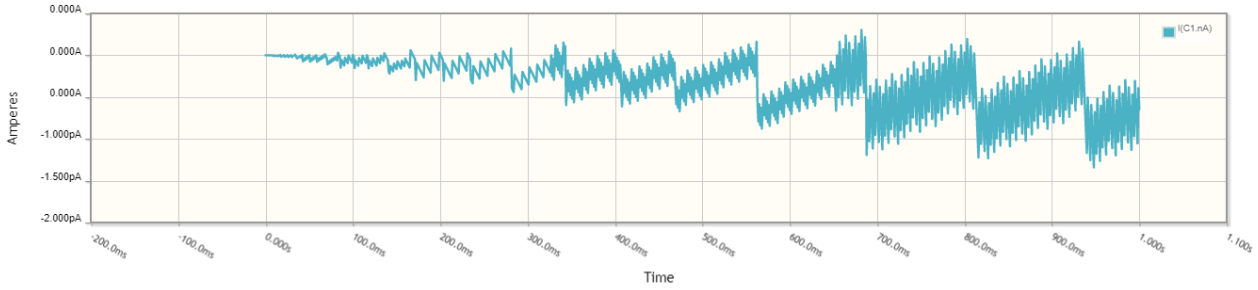

120.0kW
100.0kW
80.00kW
60.00kW
40.00kW
20.00kW
0.000W
-20.00kW
W
p(LAMP1)
-20.00mΩ
0.000Ω
20.00mΩ
40.00mΩ
60.00mΩ
80.00mΩ
100.0mΩ
120.0mΩ
LAMP1.R

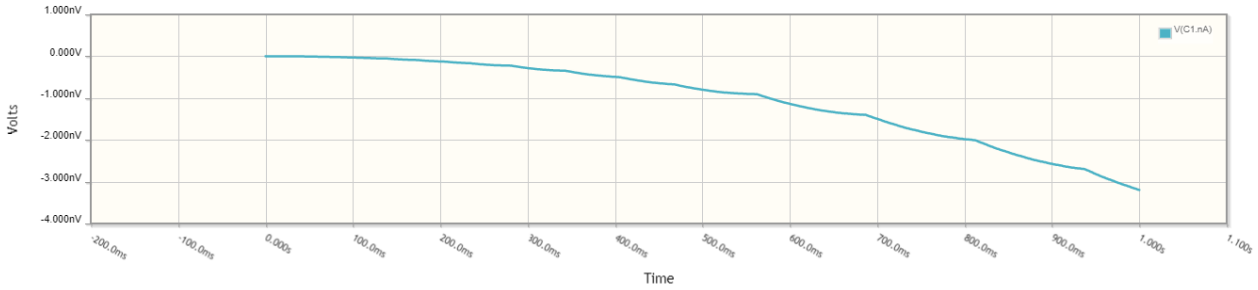
5b. 10 microfarad capacitor, sine current source



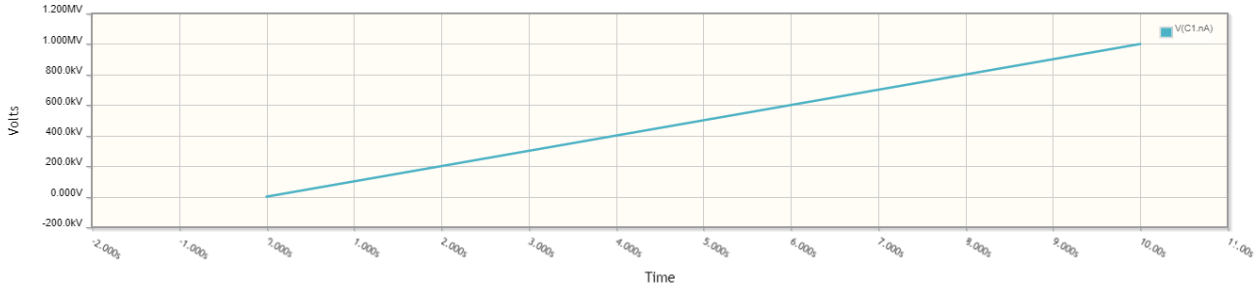


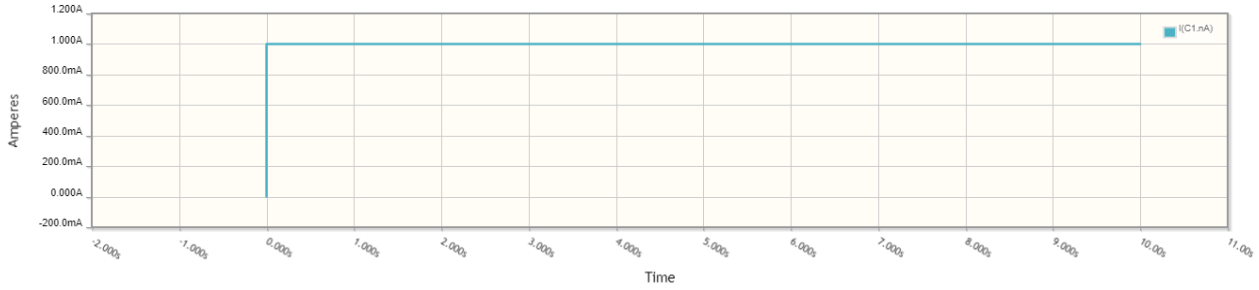
100 microfarad capacitor, sine current source



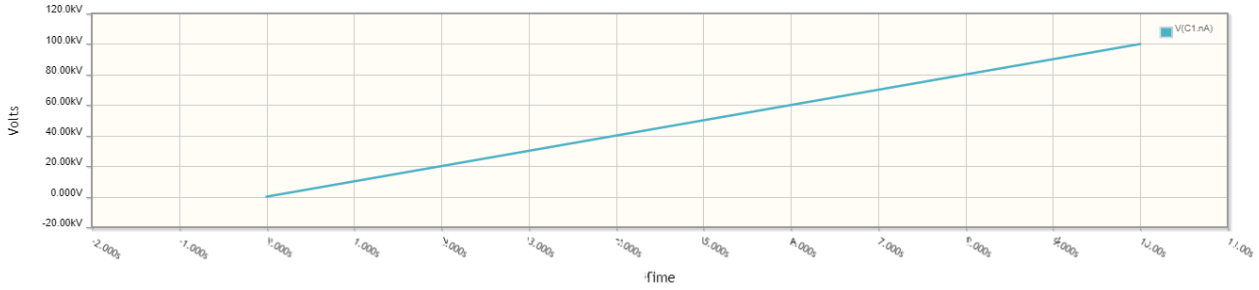


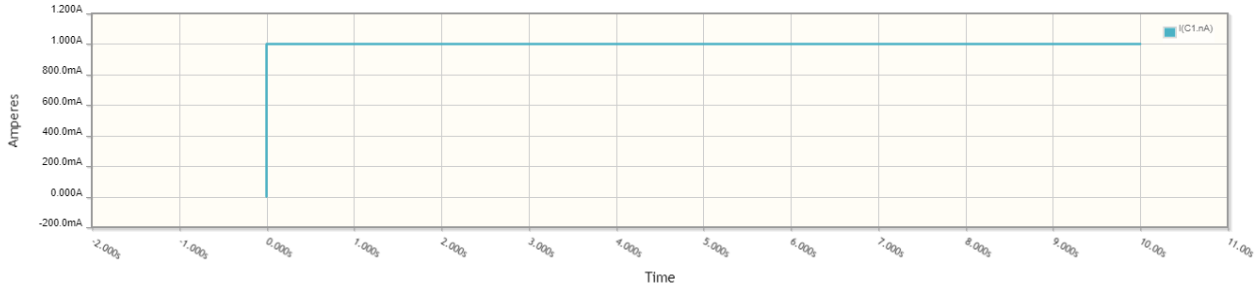
10 microfarad capacitor, step current source





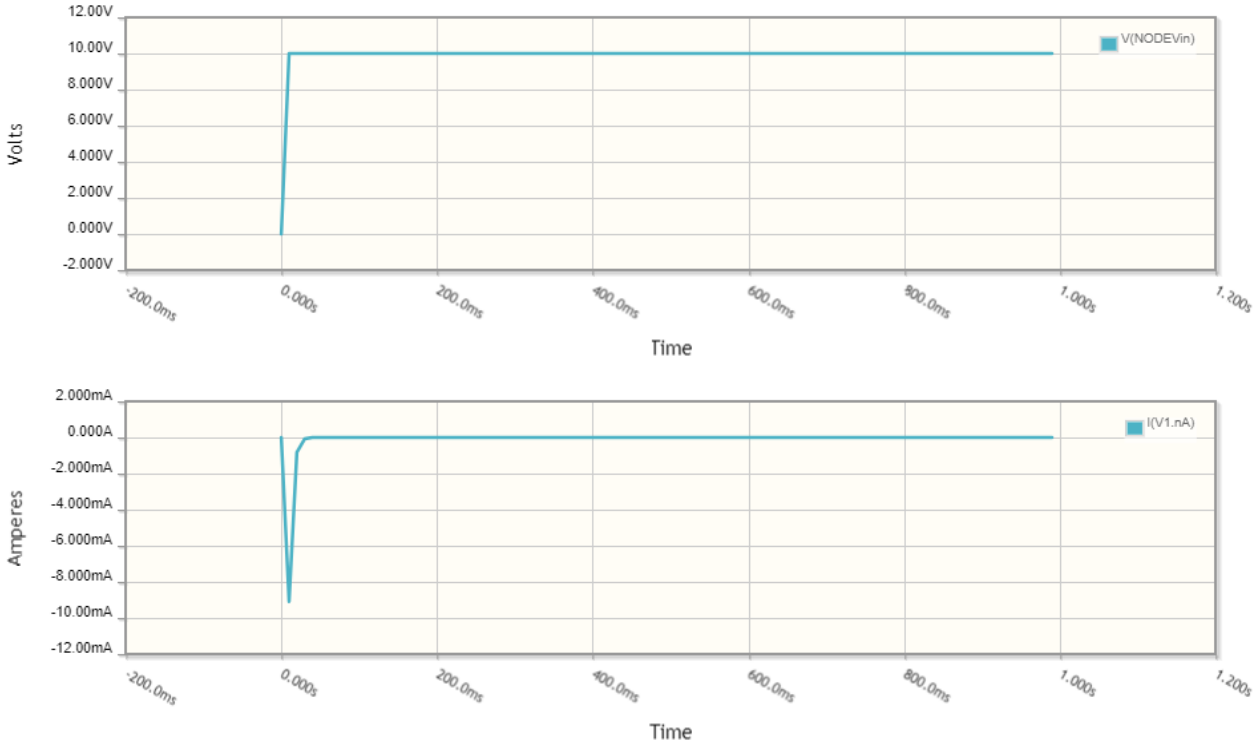
100 microfarad capacitor, step current source



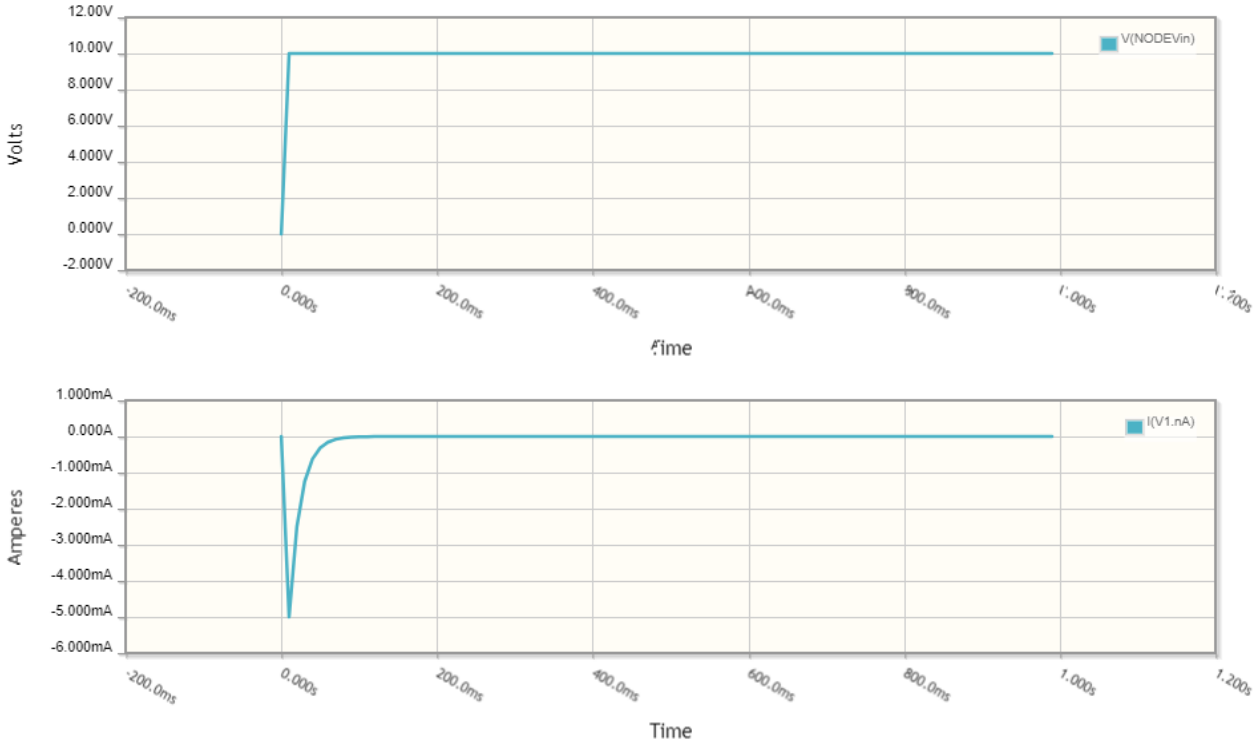


In either case, a change in capacitance caused the voltage to vary but had no effect on the current.

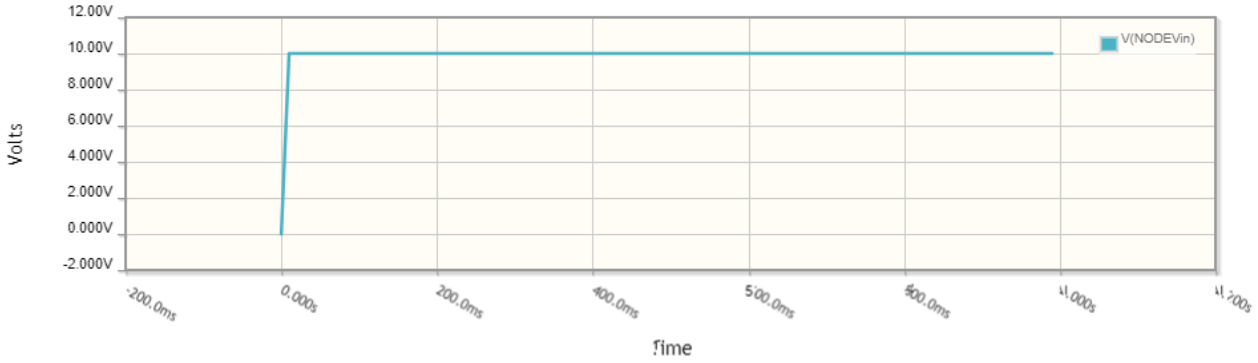
6b. 100 ohm resistor, 10 microfarad capacitor

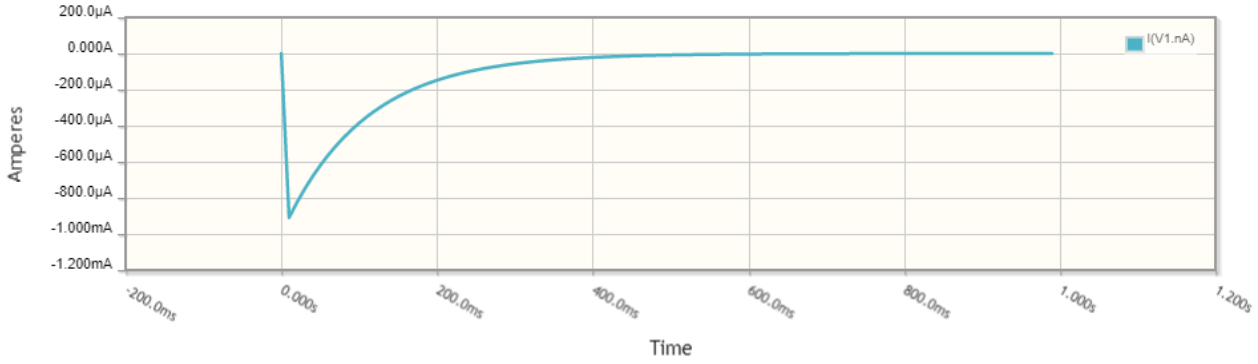


6c. 1 kohm resistor, 10 microfarad capacitor

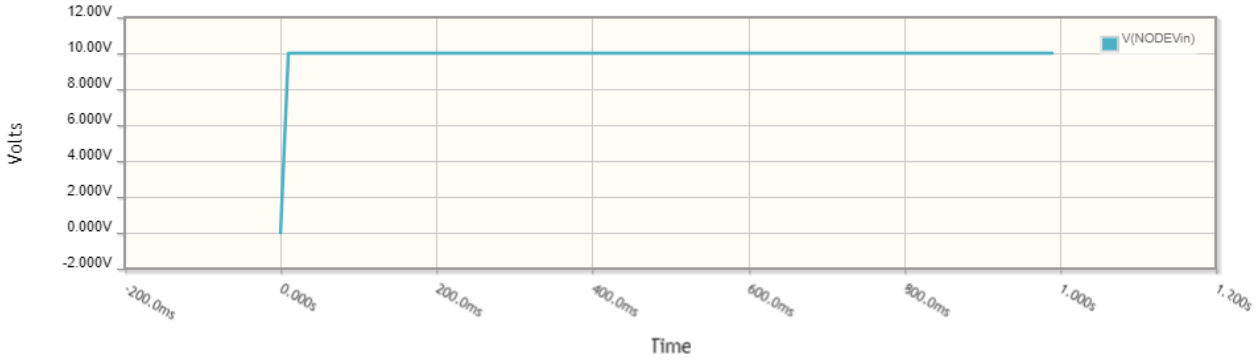


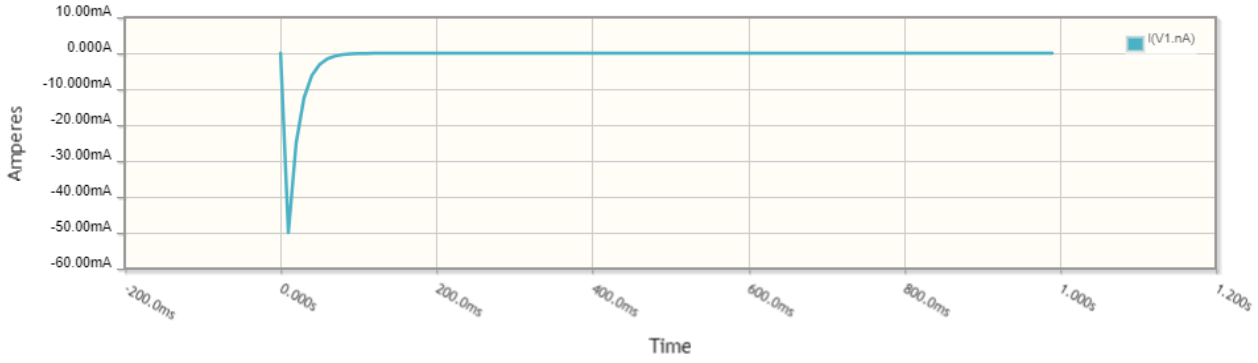
10 kohm resistor, 10 microfarad capacitor



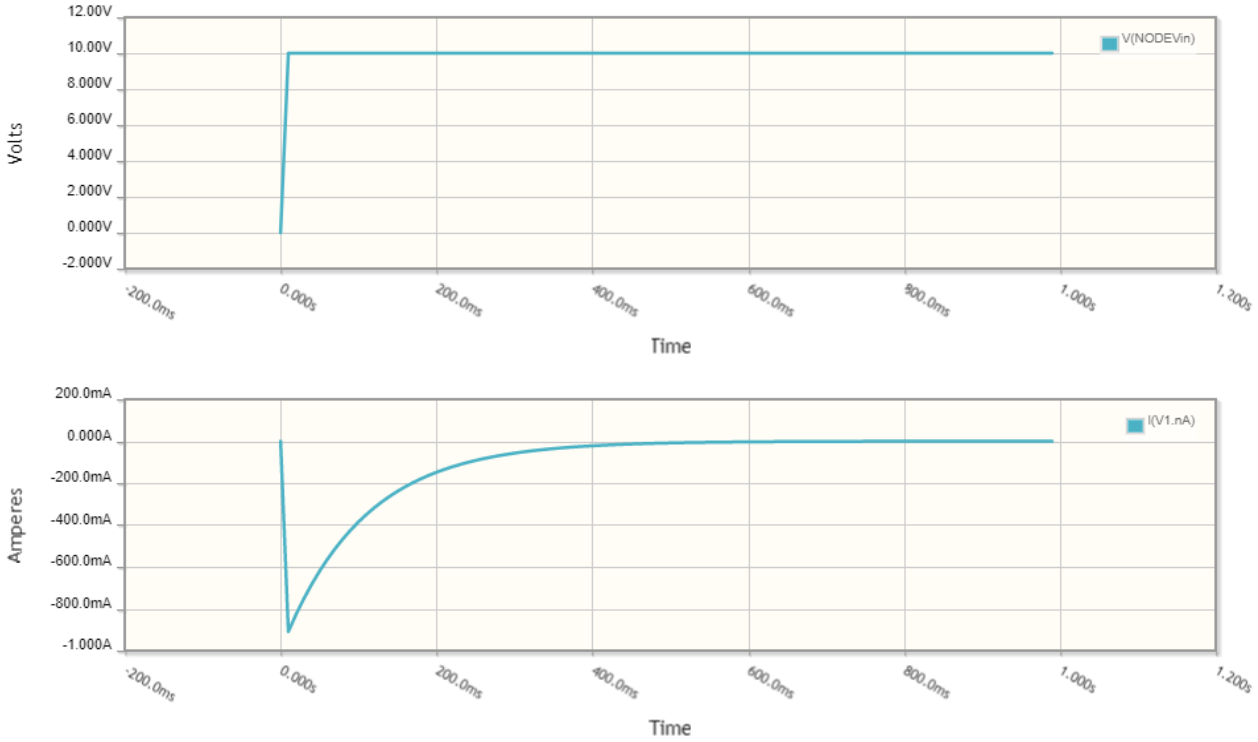


100 ohm resistor, 100 microfarad capacitor



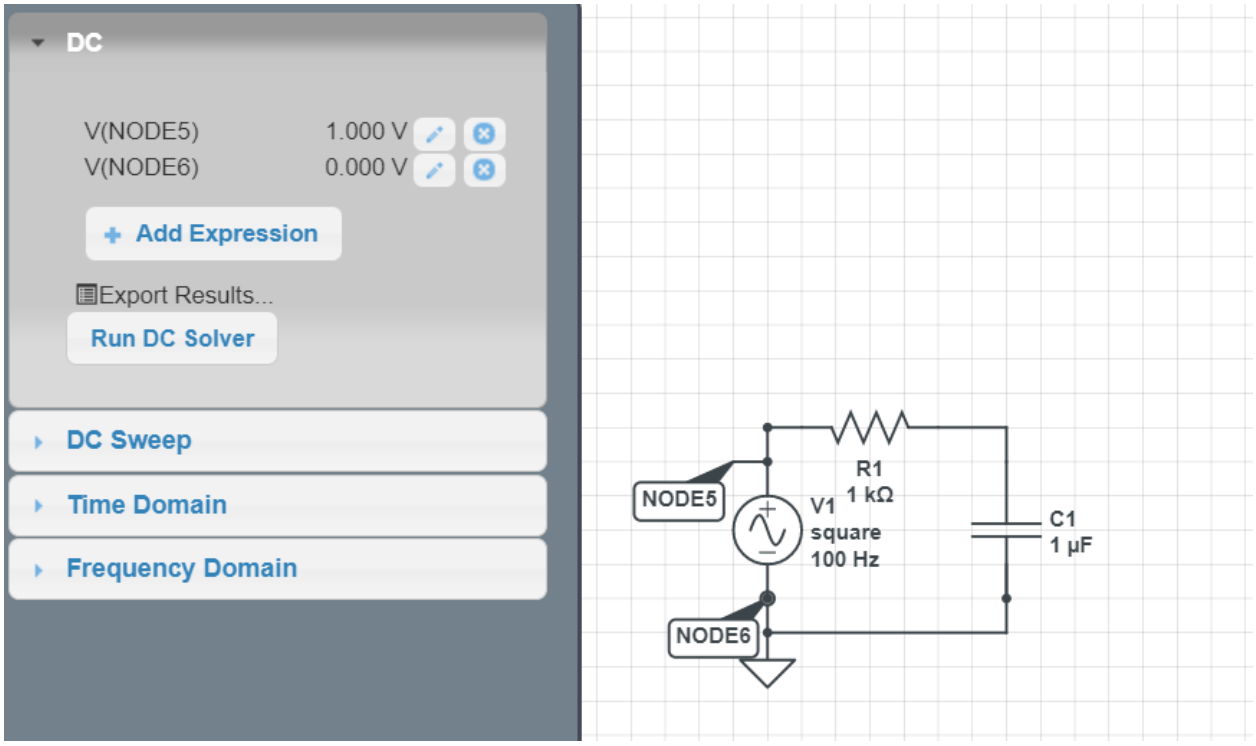


100 ohm resistor, 10 mF capacitor

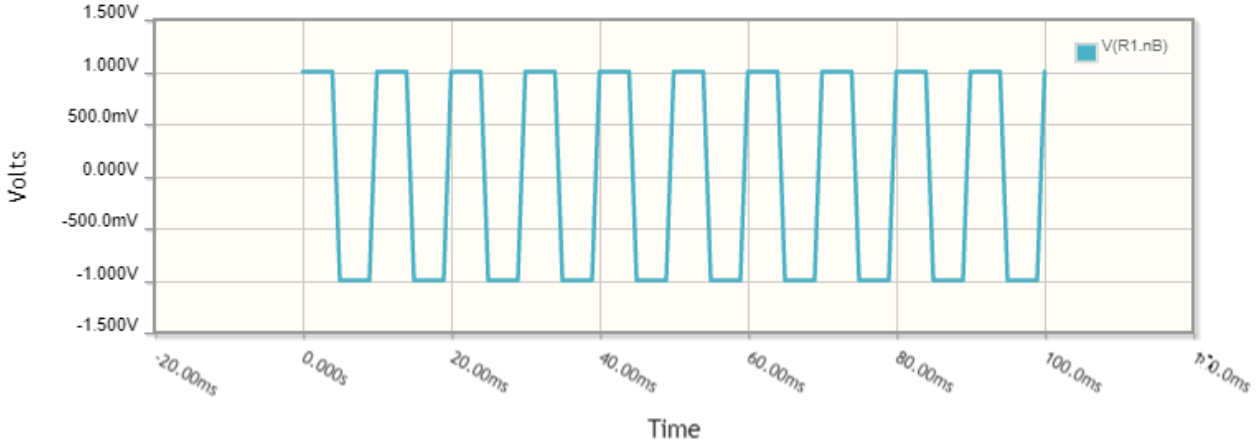


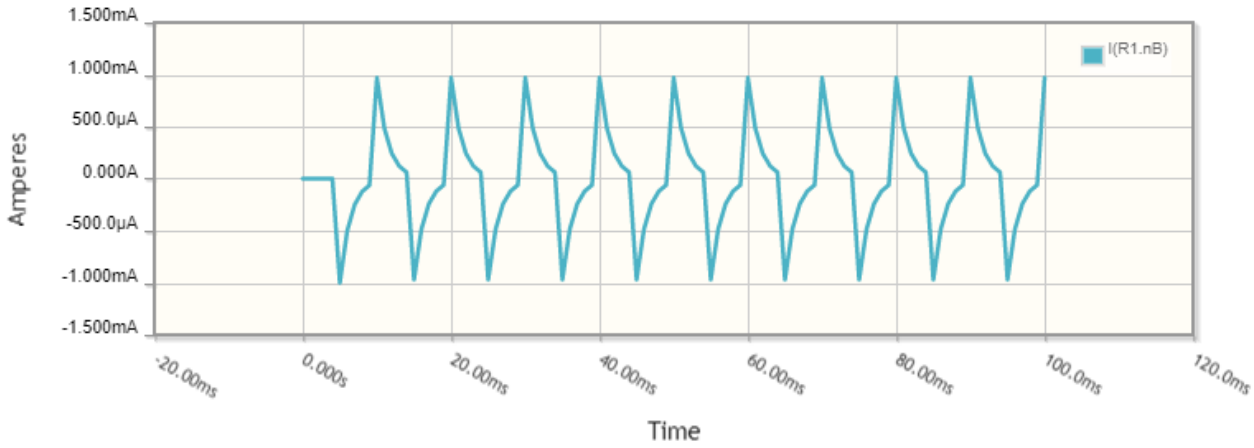
As you increase the resistance or capacitance in the system, the capacitor charges more slowly. “The characteristic time **t = *RC*** tells you that the charging/discharging is slower with a larger resistor or capacitor. This makes sense, because a larger resistor impedes the flow of current; thus slowing the charging/discharging, and a larger capacitor holds more charge; thus requiring more time to charge” [1].

7a.

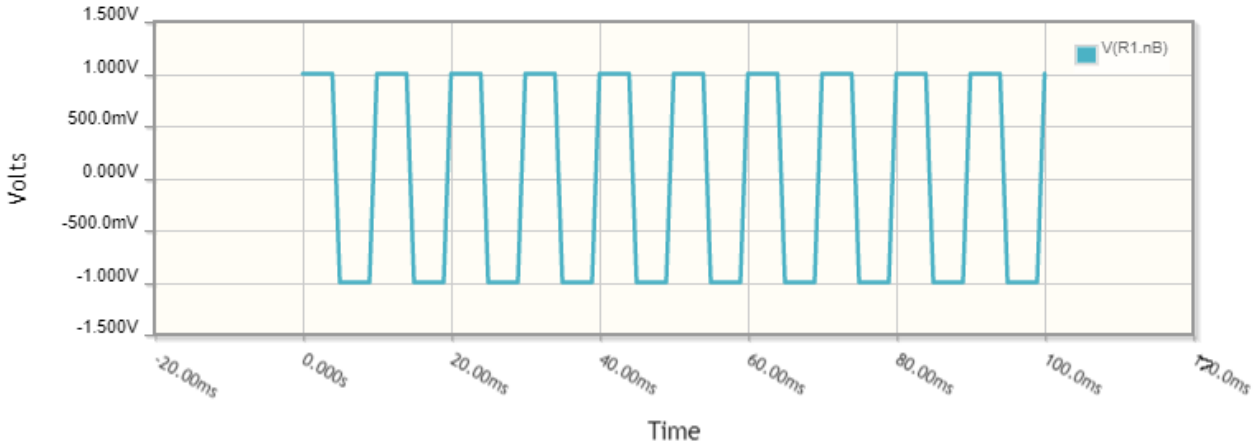


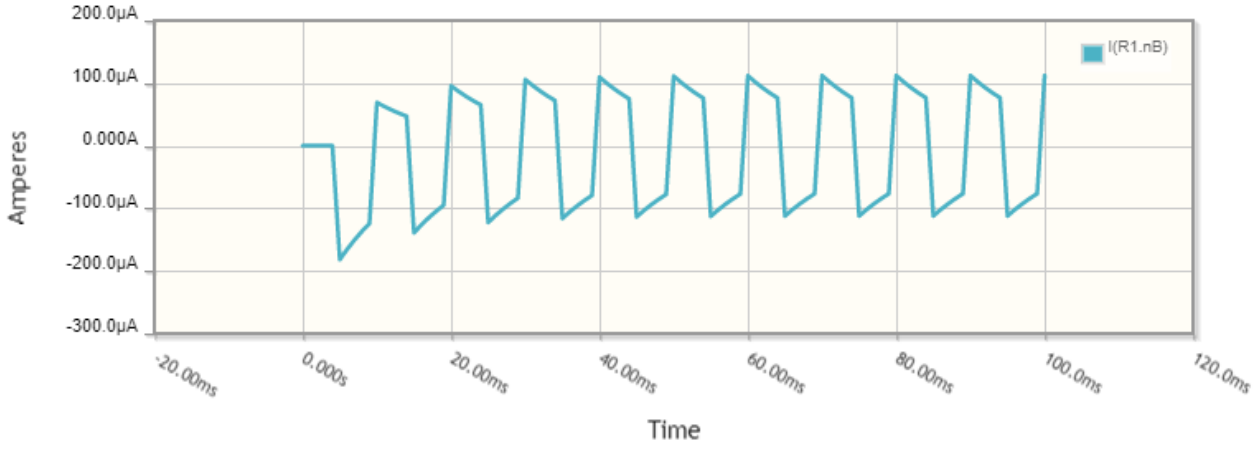
7b. 100 Hz frequency + 1 kohm resistor



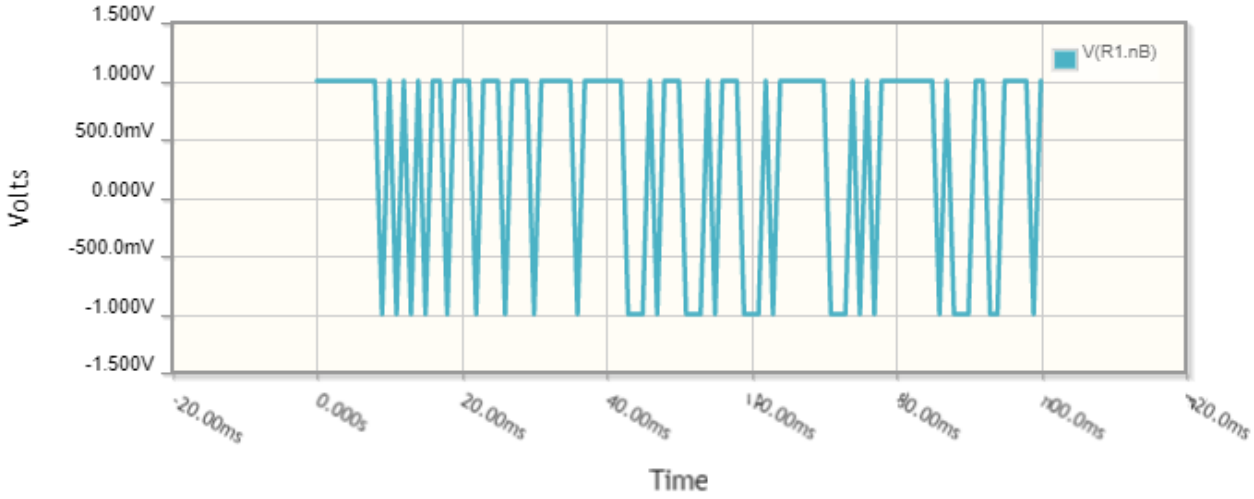


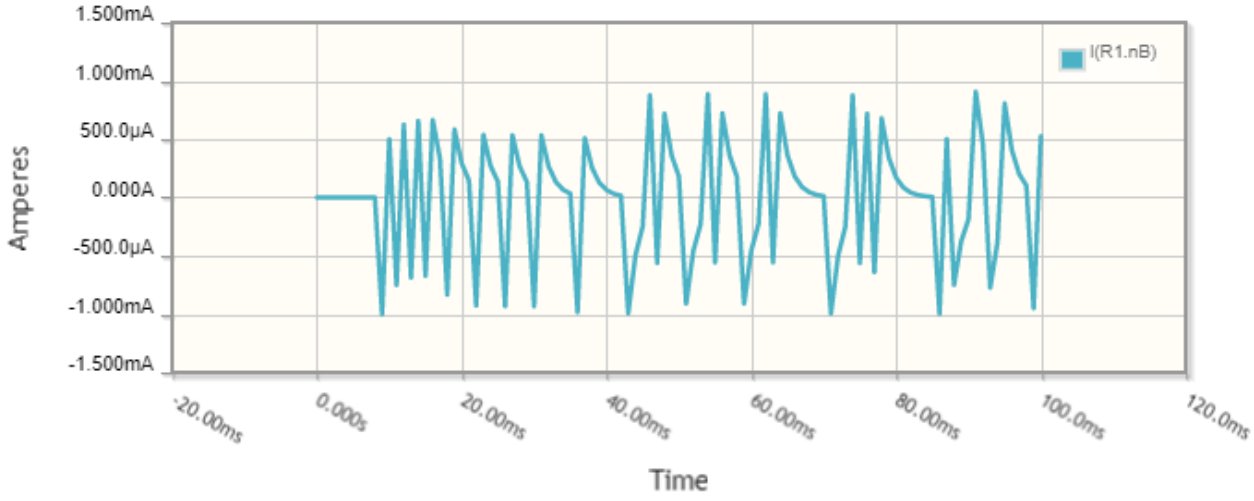
100 Hz frequency + 10 kohm resistor



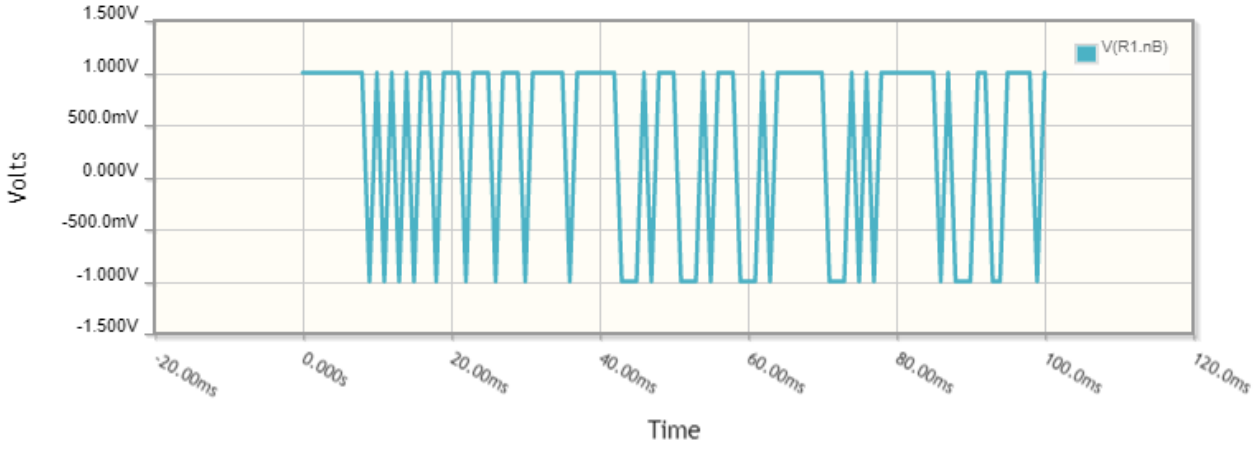


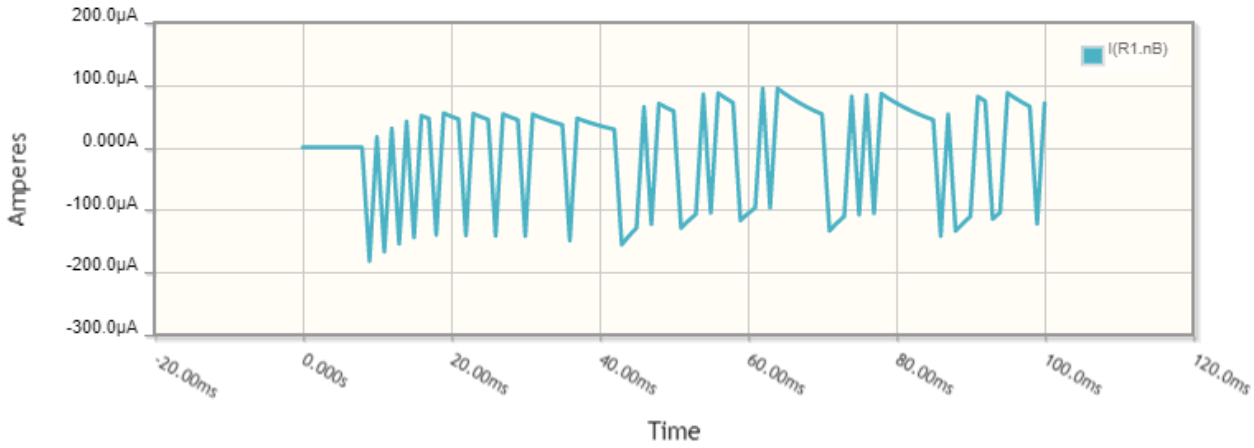
1 kHz frequency + 1 kohm resistor





1 kHz frequency + 10 kohm resistor





Changing the resistance does not affect the output voltage, it affects the current.

References

[1] https://web.pa.msu.edu/courses/2000fall/phy232/lectures/rccircuits/rc.html