RC-CIR Worksheet

Your Name: ________________________________ **Signature:** ________________________________

Lab partner(s): ____

Course & Section: ___________________ **Station #** _________________ **Date:** _________________

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1. (Section E.2.) The nominal values of the resistance and capacitance are 10 kΩ and 47 μF, respectively. What are your measured values?

R = _______ ± _______ _________ (units)

C = _______ ± _______ _________ (units)

2. (Section E.2.) What is the value of the time constant based on the measured values and nominal (labeled) values?

$\tau_{measured}$ = _______ ________ (units)

$\tau_{labeled}$ = _______ ± _______ _________ (units)

3. (Section E.7.) What is the maximum amount of charge stored on the capacitor during charging?

Q = _______ ± _______ _________ (units)

Note that you have taken two pairs of data sets, two while charging the capacitor and two while discharging it. From those graphs, read off the voltage across the resistor and the voltage across the capacitor at the end of each run.

Charging

V_R = _______ ± _______ _________ (units)

V_C = _______ ± _______ _________ (units)

Discharging

V_R = _______ ± _______ _________ (units)

V_C = _______ ± _______ _________ (units)

4. (Section E.7.) What should the two pairs of voltages add up to? Do they? Why or why not?

5. (Section G) What are the five values of the time constant?

$\tau_{measured}$ = ________ ± ________ __________ (units)

$\tau_{charging\_C}$ = ________ ± ________ __________ (units)

$\tau_{discharging\_C}$ = ________ ± ________ __________ (units)

$\tau_{charging\_R}$ = ________ ± ________ __________ (units)

$\tau_{discharging\_R}$ = ________ ± ________ __________ (units)

Compare these five values of the time constant to each other and discuss whether or not they are in agreement, within estimated errors.

τ_{mean} = ________ __________ (units)

$\tau_{std\ dev}$ = ________ __________ (units)

Therefore, τ = ________ ± ________ __________ (units)

6. (Section G) Does the residual plot indicate you had a good fit or a bad fit? Explain.

7. (Section H) What are your measured values of the resistance and capacitance of the two capacitors?

R = ________ ± ________ __________ (units)

C_1 = ________ ± ________ __________ (units)

C_2 = ________ ± ________ __________ (units)

8. (Section H) What is your calculated time constant for parallel capacitors? For series capacitors?

$\tau_{calc\_parallel}$ = ________ ± ________ __________ (units)

τ_{calc_series} = ________ ± ________ __________ (units)

9. (Section H) What is the time constant from the fit for parallel capacitors? For series capacitors?

$\tau_{fit\_parallel}$ = ________ ± ________ __________ (units)

τ_{fit_series} = ________ ± ________ __________ (units)

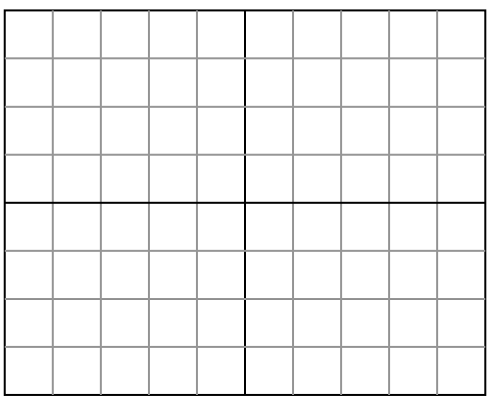
10. (Section I) What are your measured values of the resistance and capacitance? What is the theoretical time constant?

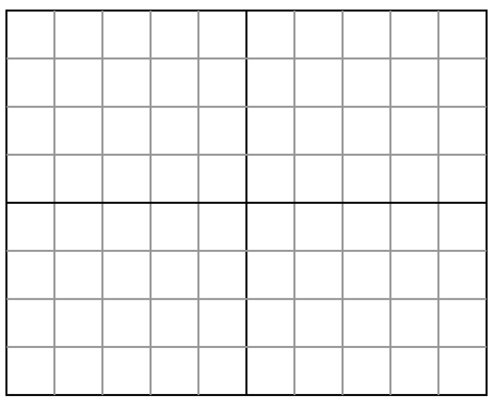
R = ________ ± ________ __________ (units)

C = ________ ± ________ __________ (units)

τ = ________ ± ________ __________ (units)

11. (Section I-analog differentiator) Sketch the waveforms you see for the sine wave and its derivative.





12. (Section I-analog differentiator) Sketch the waveforms you see for the triangle wave and its derivative.

13. (Section I-analog differentiator) Sketch the waveforms you see for the square wave and its derivative.

GRADE:_______ **GRADED BY ________**

(out of 30 points) (TA's initials)