

Calculus I
Fall 2020
Lab 8

Name (Print): _____

Show all your work, cite your sources, and type your answers for full credit.

Materials needed: paper and scotch tape

1. (15 points) Use hourly data to find the average temperature during the past 24 hours. Go to <https://w1.weather.gov/data/obhistory/KFWA.html> and enter the temperature each hour from the past 24 hours into a Desmos table. Then try fitting different a cubic polynomial to the data ($y_1 \sim ax_1^3 + bx_1^2 + cx_1 + d$)
 - (a) Export a picture of your graph and put it into this lab report.
 - (b) What is the absolute maximum/minimum temperature during 24 hours from the data?
 - (c) What is the absolute maximum/minimum temperature estimate using the trendline?
 - (d) Explain why there is a difference between your answers to the two parts above.
2. (5 points) When a critically damped RLC circuit is connected to a voltage source, the current I in the circuit varies with time according to the equation

$$I = \left(\frac{V}{L}\right) te^{-Rt/(2L)}$$

where V is the applied voltage, L is the inductance, and R is the resistance (all of which are constant).

Suppose an RLC circuit with a resistance of 30.0 volt/amp and an inductance of 0.400 volt · sec/amp is attached to a 12.0-volt voltage source. Find the maximum current that will occur in the circuit.

3. (5 points) 2. A window is being built and the bottom is a rectangle and the top is a semicircle. If there is 12 meters of framing materials what must the dimensions of the window be to let in the most light?
4. (5 points) Using one sheet of paper, make a triangular box without a lid that maximizes the volume. This is a competition. You will get points based on your rank in the class. You will need to calculate the volume of your box.

Rules:

- The base of the boat must be a triangle
- You are allowed to cut pieces off of your paper and tape them back on.
- only paper counts as part of your boat. Tape can only be used to hold paper together.