Calculus I **Name (Print):** _____
Fall 2020
Lab 8

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

Materials needed: paper and scotch tape

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1. (15 points) Use hourly data to find the average temperature during the past 24 hours. Go to `https://w1.weather.gov/data/obhistory/KASW.html` and enter the temperature each hour from the past 24 hours into a Desmos table. Then try fitting 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? Use calculus to solve this problem, and Desmos to check your answer.
   (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. Use calculus to solve this problem, and you may use technology to check your answer.

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 not 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.