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/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.