This is the second exam for Calculus I from last fall. The existence of a problem on this does not guarantee that a similar problem will exist on the upcoming exam. The nonexistence of a problem on this does not guarantee that no such problem will exist on the second exam.

1. Determine where the function below is increasing and where it is decreasing.

$$f(x) = \frac{x^3}{3} + 3x^2 + 8x + 1$$

2. On the interval [–1, 1], for the following function, find the extreme values and identify them as local or global maxima or minima.

$$f(x) = x^9$$

3. On the interval [–1, 2], for the following function, find the extreme values and identify them as local or global maxima or minima.

$$f(x) = e^{-x^2}$$

4. For the function below, identify the possible points of inflection.

$$f(x) = 2x^3 - 3x^2 + 9x + 5$$

5. For the same function in problem 4, identify where *f* is concave up and where it is concave down.

6. You have a summer internship at a farm. (You do, right?) You have exactly 600 feet of fencing and you must build an enclosure for two gardens against a long stone wall. (One garden is for rutabagas, the other is for celeriac. Mmmmmm! Mmmmmm!) The arrangement, to keep out ravenous hyenas, honey badgers, and Tasmanian devils, is depicted below. Your job: Maximize the area for the gardens.

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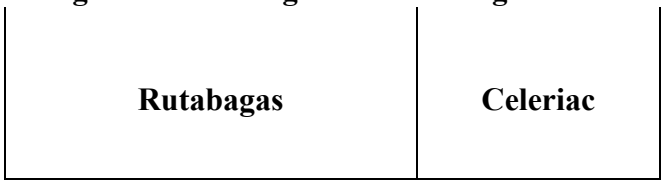

If it helps your mood, you can imagine the dividing fence is in the exact middle. I just think more people like rutabagas than celeriac. Find both length and width. Write the equation, with numbers, that yields the maximum area for the two gardens. If the numbers aren't working out nicely, you've made a mistake. (You should be able to multiply the numbers to get the area; if not, please come see me.)

7. For the following function, taking $x_0 = 0$, use Newton's Method to begin the process of finding a root. After finding the first step in the process, the number x_1, set up the equation to find the second number, x_2. Now calculate what x_2 is: If your head starts to explode, please come talk with me. If the numbers aren't working out nicely, you've made a mistake.

$$f(x) = x^3 + 2x^2 - x - 2$$