MA 113 Calculus I, Spring 2017
Written Assignment #5
Due Friday, March 24, 2017, at the beginning of lecture

Instructions: The purpose of this assignment is to develop your ability to formulate and communicate mathematical arguments. Your complete assignment should have your name and section number on each page, be stapled, and be neat and legible. *Unreadable work will receive no credit.*

You should provide well-written, complete answers to each of the questions. We will look for correct mathematical arguments, complete explanations, and correct use of English. Your solution should be formulated in complete sentences. As appropriate, you may want to include diagrams or equations written out on a separate line. You may read your textbook to find examples of how we communicate mathematics.

Students are encouraged to use word-processing software to produce high quality solutions. However, you may find that it is simpler to add graphs and equations using pen or pencil.

Let $f(x) = 20e^{\sin(x/58)}$. A biologist claims that over a one-year period starting April 1, the population of a group of insects is given by $f(x)$-million insects, where x is measured in days.

1. Experiments suggest that the insect population is greatest in late June and early July, with a maximum population around 55,000,000 insects. Does the model $f(x)$ agree with this experimental data? Why or why not? (You must justify your answer using techniques from Calculus).

2. Experiments suggest that the insect population is smallest in February, with a minimum population around 12,000,000 insects. Does the model $f(x)$ agree with this experimental data? Why or why not? (You must justify your answer using techniques from Calculus).

3. Experiments suggest that the insect population is increasing fastest in the first half of May. Does the model $f(x)$ agree with this experimental data? (You must justify your answer using techniques from Calculus).

    - NOTE: At some point in your solution to problem # 3, you will need to set a horrible function equal to zero and find the solutions. This is an example of a situation where you cannot effectively do this by hand, the function is too complicated. (Welcome to the real world!) So, for this part of the third problem, you are allowed to use wolframalpha.com or a calculator to approximate the solutions. In wolframalpha, if you want to find the solutions to a certain equation $F(x) = 0$ on an interval $[a, b]$, you enter "solve $F(x) = 0$ on $[a, b]$".