MA 113 Calculus I, Fall 2017
Written Assignment #2
Due Friday, January 27, 2017, at 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.

Suppose that the position of a particle after x seconds is given by $s(x) = \sin\left(\frac{10\pi}{x}\right)$ meters. The point $P = (1, 0)$ lies on the graph of $s(x)$, meaning that at $x = 1$ second the particle is at position 0.

1. Compute the average velocity of the particle between 1 and x for the following values: $x = 1.5, 1.4, 1.3, 1.2, 1.1, 0.5, 0.6, 0.7, 0.8$, and 0.9.

2. From this data, is it possible to make a good guess for the limit of the average velocity of the particle between 1 and x when x is close to 1? Why or why not?

3. Sketch the graph of $s(x)$ between $x = 0.5$ and $x = 1.5$, and identify the point P on the graph. (You may use www.desmos.com or a graphing calculator to find the graph, but you should sketch it by hand.)

4. Explain why it is true that if $Q = (x, \sin\left(\frac{10\pi}{x}\right))$ is a point on the graph of $s(x)$, then the slope of the line between P and Q is equal to the average velocity of the particle between time 1 and time x.

5. Compute the average velocity of the particle between 1 second and 1.01 second.

6. Explain using the graph of $s(x)$ why this will give a good estimate of the instantaneous velocity of the particle at 1 second.