

MA 113 CALCULUS I, SPRING 2016
WRITTEN ASSIGNMENT #5
Due Friday, March 25, 2016, 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.

1. (5 points) An object moves in a straight line and its position is given by a function $s(t)$ where t is the time in seconds and $s(t)$ is the number of meters from its starting point. Let $v(t)$ denote the velocity of the object given in meters per second. Assume that $s(t)$ and $v(t)$ are differentiable functions.

We are told that $s(2) = 7$, $s(4) = 13$, and $s(9) = 38$. Use the Intermediate Value Theorem and the Mean Value Theorem to carefully explain why the object is moving exactly 4 meters per second at some moment between $t = 2$ and $t = 9$.

2. (5 points) Two runners run in a straight line and their positions are given by functions $g(t)$ and $h(t)$, where t is the time in seconds, and $g(t)$ is the number of meters from the starting point for the first runner and $h(t)$ is the number of meters from the starting point for the second runner. Assume that $g(t)$ and $h(t)$ are differentiable functions.

Suppose that the runners begin a race at the same moment and end the race in a tie. Carefully explain why at some moment during the race they have the same velocity. (Suggestion: Consider the function $f(t) = g(t) - h(t)$ and use Rolle's Theorem.)