MA 113 Calculus I, Fall 2016
Written Assignment #6
Due Friday, November 4, 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.

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1. (2 points) Assume that f is a differentiable function. Use the Mean Value Theorem to answer the questions below.

   (a) If $f(2) = -3$ and $f'(x) \geq 7$ for all $x > 2$, then explain why $f(5) \geq 18$.

   (b) Use the Mean Value Theorem to demonstrate that if $f(a) = b$ and $f'(x) \geq d$ for all $x > a$, then $f(x) \geq d(x - a) + b$ for all $x \geq a$.

2. (8 points) Let $f(x) = x^4 - 54x^2 + 21$. Answer the following questions. Show your calculations and give justifications or explanations.

   (a) (1 point) Find the critical points c of $f(x)$.

   (b) (2 points) Find the intervals where $f(x)$ is increasing and the intervals where $f(x)$ is decreasing.

   (c) (2 points) Find the intervals where the graph of $f(x)$ is concave up and the intervals where the graph of $f(x)$ is concave down.

   (d) (2 points) For each critical point c, determine whether $f(c)$ is a local maximum value or a local minimum value or neither.

   (e) (1 point) Find all the points of inflection, if any, of $f(x)$.