MA 113 Calculus I, Fall 2018

Written Assignment #3

Due Friday, 28 September 2018, 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. Which higher derivatives of $f(x) = 6x^6 + \dfrac{x^4}{10} - x^3 + \pi x - 2$ satisfy $f^{(n)}(0) = 0$? Show your work.

2. For each integer $n \geq 0$, find a condition on the coefficient of x^n in $f(x) = 6x^6 + \dfrac{x^4}{10} - x^3 + \pi x - 2$ that implies $f^{(n)}(0) = 0$.

3. Is this implication true for all polynomials? If yes, explain why. If no, explain why not.

4. Is it possible for a polynomial $g(x)$ to have the following values for its higher derivatives: $g^{(n)}(0) = 1$ for all $n \geq 0$. Why or why not? **Hint: Use the answer to problem 3.**