

MA 113 CALCULUS I, SPRING 2017 WRITTEN ASSIGNMENT #4

Due Friday, February 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.

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1. Let  $f(x) = e^{2x}$ . For any  $n \geq 0$ , find a formula for  $f^{(n)}(x)$  and explain why your formula is correct.
2. Let  $f(x) = xe^x$ . For any  $n \geq 0$ , find a formula for  $f^{(n)}(x)$  and explain why your formula is correct.
3. Let  $f(x) = e^{x^2}$ . Explain why  $f^{(n)}(0) = 0$  when  $n$  is odd. (Hint: compute  $f^{(n)}(x)$  for  $n = 1, 2, 3, 4, 5$  and write each of these as the product of a polynomial times  $e^{x^2}$ , then look for a pattern with the polynomial exponents that you can explain for all  $n$ .)