

# Calculus I

## Exam 2 (Take-Home Portion)

Mammenga

Due at the start of class on Monday, March 3

There are a total of 35 points on this exam. Read each question/problem carefully. Write complete answers in your blue book and make sure your writing is legible. Don't forget to check your work. Good luck!

*When completing this exam, you are allowed to communicate with your (optional) team members and myself, but NO ONE else. (In particular, you may not collaborate with a member of any other team, and you may not discuss any part of this exam with a tutor.) If you choose to ignore this rule, your team can expect to receive a zero on this portion of the exam.*

- (15 points) Suppose that  $f'(1) = 3$  and  $f^{-1}(-1) = 1$ .
  - Find  $f(1)$ , or explain why you do not have enough information to do so.
  - Find  $(f^{-1})'(-1)$ , or explain why you do not have enough information to do so.
  - Find  $(f')^{-1}(-1)$ , or explain why you do not have enough information to do so.
- (10 points) Let  $g(x) = \arctan(x^3 - \ln(x + 1))$ . Find *two* points (each coordinate rounded to the nearest thousandth) on the graph of  $g(x)$  which have tangent lines with slope equal to 0.85. You are encouraged to use Derive (or any other graphing utility) to solve this problem, but you should explain exactly how you used it.
- (10 points) A fence that is 8 feet tall runs parallel to a tall building at a distance of 4 feet from the building. What is the *exact* length of the shortest ladder that will reach from the ground over the fence to the wall of the building? Explain your reasoning (your explanation must involve calculus).