

# Calculus 1 — Outline for Exam 3

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## Main ideas

- A. Using derivatives to find absolute extrema of a function on an interval
- B. Using derivatives to find intervals of increasing/decreasing, local extrema, concavity, inflection points
- C. Optimization word problems
- D. L'Hôpital's rule
- E. Mean Value Theorem

## Skills you should have

1. Be able to find the absolute maximum and minimum of a function on a closed interval
  - (a) Find the critical numbers and endpoints—then test in original function
2. Be able to use the first and second derivatives of a function  $f$  to understand the behavior of  $f$ 
  - (a) Connection between  $f'$  positive/negative and  $f$  increasing/decreasing
  - (b) Connection between  $f''$  positive/negative and  $f$  concave up/down
  - (c) Be able to determine when critical numbers are local maximums, local minimums, or neither
  - (d) Be able to find inflections points
  - (e) Be able to use all of this information (and intercepts, asymptotes, ...) to sketch graphs
3. Be able to solve optimization word problems
  - (a) Carefully identify the function to maximize or minimize
  - (b) Be able to use the constraints to obtain a function to optimize in a *single variable*
4. Be able to use L'Hôpital's rule to compute limits
  - (a) The rule only applies to limits of the form  $\frac{0}{0}$  or  $\frac{\infty}{\infty}$
  - (b) Know how to deal with limits of the form  $0 \cdot \infty$  by “flipping something over”
  - (c) Know how to deal with limits of the form  $\infty - \infty$  (often by finding a common denominator)
  - (d) Know how to deal with limits of the form  $0^\infty$ ,  $1^\infty$ ,  $0^0$ , and  $\infty^0$  using logarithms
5. Understand the Mean Value Theorem (and Rolle's Theorem), see section 4.2
  - (a) Be able to state the Mean Value Theorem
  - (b) Have a working understanding of the Mean Value Theorem

## How to study

- I. Review core topics
- II. Work *lots* of problems all of the way through—focus on WebAssign problems and Group Work problems
- III. Practice doing several problems in a short amount of time (by timing yourself)
- IV. Come talk with me if you have any questions