

Calculus 1 — Outline for Exam 3

Main ideas

- A. Related rates word problems
- B. Using derivatives to find absolute extrema of a function on an interval
- C. Using derivatives to find intervals of increasing/decreasing, local extrema, concavity, inflection points
- D. Sketching the graph of a function based on intervals of increasing/decreasing, local extrema, concavity, and inflection points
- E. L'Hôpital's rule

Skills you should have

1. Be able to solve related rates problems
 - (a) Pay close attention to what is constant with respect to time and what is not
 - (b) Make sure to practice finding relating equations, e.g. Pythagorean Theorem, similar triangles, area formulas, etc. (I will give you volume formulas if you need them.)
2. Be able to find the absolute maximum and minimum of a function f on a closed interval
 - (a) Find the critical numbers and endpoints—then test in the original function f
3. 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
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) Limits of the form 0^∞ , 1^∞ , 0^0 , and ∞^0 will NOT be on this exam

How to study

- I. Review core topics
- II. Work *lots* of problems all of the way through—focus on WeBWorK problems and Worksheet 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

INSTRUCTIONS FOR EXAM 3

Points. The exam is out of ?? points.

Due date. This take-home exam is due at **11:59PM on Monday, April 27.**

Submission. Please scan each page of your exam, including this front page, and your note sheet too. You may use a camera to do this. Then upload the scan/pictures to Canvas in the assignment titled Exam 3. You can find it here: <https://csus.instructure.com/courses/58213/assignments/653322>

Rules for the exam.

1. You are **NOT** allowed any resources on this exam except for one sheet of notes made before the exam. This includes: no books, no notes from class, no pictures from class, no advanced calculators, and no internet resources of any kind.
2. You are **NOT** allowed to discuss the exam—in any way—with anyone other than Josh Wiscons. This includes: no talking, no texting, no posting, and no leaving notes about the exam.
3. You are **NOT** allowed to look at another person's exam or their work.
4. You are **NOT** allowed to let another person see your exam or your work.
5. Fully justify your work unless explicitly told otherwise.
6. You are allowed to use:
 - a basic calculator;
 - one regular size sheet of paper with any notes on it you want. Please upload photos of your note sheet with your exam.
7. If you have any questions about these rules, please email me right away.

Any violation of the rules will be regarded as cheating and reported to the Sacramento State Office of Student Conduct.

Recommendations. I recommend setting aside **1.5 continuous, uninterrupted hours** to devote to the exam. But you can take as long as you want. Try to do this before Monday, and then use Monday to finalize and submit your work. Please try hard to find a quiet place to work. Please email me if you have any questions!