

Calculus 1 — Outline for the Final Exam

Anything that is crossed out will NOT be on the final exam!

Main ideas

Old

- A. Limits (one-sided, two-sided, and at infinity) and continuity
- B. The derivative of a function and tangent lines
- C. Derivative formulas for power, trigonometric, inverse trig., exponential, and logarithmic functions

Only these: x^n , e^x , $\ln x$, $\sin(x)$, $\cos(x)$, $\tan(x)$, $\sec(x)$, $\arcsin(x)$, $\arctan(x)$, $\text{arcsec}(x)$

- D. Derivative rules including product, quotient and chain rules
- E. Implicit differentiation
- F. Interpreting f' and f'' : increasing/decreasing, local extrema, concavity, inflection points
- G. Using derivatives to find absolute extrema
- H. ~~Applications of differentiation to related rates and optimization~~
- I. L'Hôpital's rule

New

- J. Definition of the definite integral and the (net) area under a curve
- K. Fundamental Theorem of Calculus ~~and net change of a function~~
- L. Finding antiderivatives and solving indefinite integrals
- M. Finding antiderivatives using substitution

Skills you should have

1. Be able to compute basic limits graphically, algebraically, and from a table of numbers
2. Be able to determine graphically if a function is continuous or differentiable
3. Be able to compute derivatives and tangent lines using the various derivative rules and formulas
4. Be able to find $\frac{dy}{dx}$ for implicitly defined functions, e.g. $\sin(xy) = x^2 + e^y$
5. Be able to interpret the first and second derivatives of a function f
 - (a) Connection between f' positive/negative and f increasing/decreasing
 - (b) Connection between f'' positive/negative and f concave up/down
 - (c) Finding local extrema and inflection points
6. Using L'Hôpital's rule

- (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 $0 \cdot \infty$ and $\infty - \infty$ by converting to a fraction
7. Be able to approximate $\int_a^b f(x) dx$ (or the net area under a function) using R_n , L_n , or M_n for a fixed value of n (like $n = 6$).
 8. Be able to evaluate a definite integral $\int_a^b f(x) dx$ using...
 - (a) geometry: thinking of $\int_a^b f(x) dx$ as the net area between f and the x -axis from a to b
 - (b) FTC 2: $\int_a^b f(x) dx = F(b) - F(a)$ for F an antiderivative of f
 - this is the method to practice the most; it relies on being able to find antiderivatives
 9. Be able to find indefinite integrals and antiderivatives
 - (a) know common antiderivatives
 - this comes from knowing your derivative formulas really well; also make sure to review the antiderivative formulas for power functions
 - (b) practice u -substitution

How to study

- I. Review core topics
- II. Work *lots* of problems all of the way through—focus on WeBWorK problems and Worksheet problems
 - start by practicing the newest material: WeBWorK 16 and 17; Worksheets 26–30
- III. Come talk with me if you have any questions

INSTRUCTIONS FOR THE FINAL EXAM

Points. The exam is out of ?? points.

Due date. This take-home exam is due at **11:59PM** on **Thursday, May 14**.

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 Final Exam. You can find it here: <https://csus.instructure.com/courses/58213/assignments/653323>

Rules for the exam.

1. You are allowed to use:
 - a basic calculator;
 - a note sheet: one regular size sheet of paper with any notes on it you want, made before starting the exam. Please upload a scan of your note sheet with your exam.
2. You are **NOT** allowed any resources on this exam except for a basic calculator and your note sheet. This includes: no book, no notes from class, no pictures from class, no advanced calculators, and no apps or internet resources of any kind.
3. 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.
4. You are **NOT** allowed to look at another person's exam or their work.
5. You are **NOT** allowed to let another person see your exam or your work.
6. Fully justify your work unless explicitly told otherwise.
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 **2 continuous, uninterrupted hours** to devote to the exam. But you can take as long as you want. Try to do this on Monday (which is the day of our final exam time), and then use the remaining time to finalize and submit your work. Please try hard to find a quiet place to work. Please email me if you have any questions!