Math 1a. Introduction to Calculus
Review Guide for Midterm II

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Midterm Details

The first midterm will primarily cover Chapter 3 and 4 (through 4.8), but you will also be responsible for any previous material covered in the course. The midterm exam will be on Tuesday, December 13 at 7-9 PM in Science B. There will also be a course-wide review session on Thursday, December 8 at 7-9 PM in Science D. We plan to videotape the review session. You should be able to access the video by clicking on Lecture Videos at the course website.

Studying and Reviewing

- You can find copies of old midterms as well as solutions by clicking on Previous Exams at the course website.
- You should also try working some of the problems in the review sections of Chapter 3 (pp. 255–257) and Chapter 4 (pp. 335–338). We will post solutions to these problems on the course website on the Exams page.
- Be sure to take advantage of the TF office hours, CA sections, and the MQC in Loker Commons.

Topics for Midterm II

- To understand and be able use the power rule and the derivative of e^x. These rules should be developed from the definition of the derivative (Section 3.1).
- To understand and be able to apply the definition of e (Section 3.1).
- To understand and be able the product and quotient rules for differentiating functions (Section 3.2).
- To understand and be able to applying the concept of a derivative to applications in the natural and social sciences (Section 3.3).
- To understand and be able to evaluate the derivatives of trigonometric functions (Section 3.4).

- To understand and be able to apply the chain rule when differentiating composite functions (Section 3.5).
- To understand and be able to apply the chain rule when differentiating implicitly defined functions (Section 3.6).
- To understand and be able to apply the derivatives of the inverse trigonometric functions (Section 3.6).
- To understand and be able to determine when two curves are orthogonal (Section 3.6).
- To understand and be able to apply the basic logarithmic differentiation formula (Section 3.7).
- To understand and be able to apply the technique of logarithmic differentiation (Section 3.7).
- To understand and be able to apply the concept of e as a limit (Section 3.7).
- To understand and be able to apply the process of linearizing a function at $x = a$ (Section 3.8).
- To understand and be able to the differential as the difference between the linearization of a function and the function itself (Section 3.8).
- To understand and be able to the concept of related rates (Section 4.1).
- To understand the definition of local and absolute extrema both intuitively and precisely (Section 4.2).
- To understand and be able to apply the Extreme Value Theorem and Fermat's Theorem (Section 4.2).
- To understand and be able to find critical values and use the closed interval method (Section 4.2).
- To be able to use the first derivative to determine whether a function is increasing or decreasing (Section 4.3).
- To understand and be able to apply the First and Second Derivative Tests for local maxima and minima (Section 4.3).
- To understand and be able to apply the Mean Value Theorem (Section 4.3).
- To understand the relationship between concavity and the behavior of the first derivative (Section 4.3).
- To be able to use the second derivative to determine concavity and points of inflection (Section 4.3).
- To be able to use calculus to sketch the graphs of functions (Section 4.3).
- To recognize the indeterminate forms $0/0$, ∞/∞, and $\infty - \infty$ and be able to apply L'Hôspital's Rule when evaluating limits of these indeterminate forms (Section 4.5).
- To understand l'Hospital's Rule in terms of relative rates of change (Section 4.5).
- To recognize the indeterminate forms $0 \cdot \infty$, 1^∞, ∞^0, 0^∞, and 0^0 and be able to apply l'Hospital's Rule when evaluating limits of these indeterminate forms (Section 4.5).
- To be able to set up and solve optimization problems using calculus (Section 4.6).
- To be able to apply calculus to problems in business and economics (Section 4.7).
- To be able to use the Newton-Raphson algorithm to approximate roots of functions (Section 4.8).