

Will's Guide To Life, Volume 3

Math 220

Spring 2009

Preliminaries

Remember that the work is more important than the final answer! There is a limit on time, so work hard and work efficiently, do not spend all of your time working any one problem. It is better to have studied too much and be over-prepared than to understudy and do poorly.

You will be expected to know the definitions and statements of the major results and ideas covered in lecture. You need to be able to state **all** hypotheses of the Theorems. Do not waste time simplifying expressions unless specifically directed to do so, or is required to answer the question.

Section 3.1

Linear Approximations and Newton's Methods. The linear approximation of a function f at x_0 . Why this is sometimes called the "Tangent line approximation." Increments and differentials, the picture that explains these. Using linear approximations to approximate harder functions, how to pick a good base point. Newton's Method. Where the formula for Newton's Method comes from.

Section 3.2

Indeterminate Forms and L'Hôpital's Rule. The Indeterminate forms that work for L'Hôpital's Rule. What needs to be true in order to use L'Hôpital. Manipulating other indeterminate forms into forms on which L'Hôpital can be used. Why indeterminate forms are indeterminate.

Section 3.3

Maximum and Minimum Values. Definitions of absolute and local extrema. The difference between absolute and local extrema. The Extreme Value Theo-

rem, critical numbers and Fermat's Theorem. The relationship between critical numbers and extrema.

Section 3.4

Increasing and Decreasing Functions. Definition of strictly increasing and decreasing functions, relation to the derivative. Why this relationship is true (MVT). The First Derivative Test.

Section 3.5

Concavity and the Second Derivative Test. Concave up and concave down, what this means for the function and its derivatives. Inflection points. The Second Derivative Test.

Section 3.6

Overview of Curve Sketching. Using the results of sections 3.3-3.5 (and previous chapters) to aid in accurately sketching graphs of functions. The important things you need to check to do this.

Section 3.7

Optimization. How to turn a word problem into a calculus problem, then do the appropriate calculus to solve the problem, and finally give a physical solution to the word problem. Optimizing functions given constraints. This will require some use of geometry and other math skills. Applications in real life where optimization is necessary.

Section 3.8

Related Rates. Setting up word problems into calculus. Related rates as an application of implicit differentiation.

Other Info

- The exam will test both your knowledge of the concepts and ideas presented as well as your ability to work problems.
- Remember that the right work is far more important than the right final answer.

- Be sure to clearly indicate your final answer to a problem by boxing or circling and labeling it as your final answer.
- The best way to study is to re-read your lecture notes and the book, work through the suggested homework problems and look over your graded work. Learn from the mistakes you have made on quizzes and homework, do not repeat them on the exam.

For more Math 220 related information, be sure to check the course website:
www.math.uiuc.edu/~wgreen4/math220_spring09.html