Math 161 §4, Fall 2009
Calculus 1
2-2:50 MWF CNS E106

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Text:	Varberg,Purcell, Rigdon, **Calculus**, 9^{th} edition, Pearson-Prentice Hall

Course Description

Calculus is a branch of mathematics which developed from consideration of two problems: the analysis of rates of change and what they tell you about functions and the careful consideration of calculation of areas of regions bounded by the graphs of functions. These are the subject matter of differential calculus and integral calculus, respectively. The Fundamental Theorem of Integral Calculus shows that for sufficiently nice functions differentiation and integration are dual problems. In our calculus sequence we concentrate on differential calculus in 161, integral calculus in 162, and generalizations to other domains (series and multivariate calculus) in 263 and 264.

Modern rigorous calculus rests on the concept of a limit, so we will start with a careful consideration of what limits are (and the much easier task of actually finding them). We will characterize some of the properties of continuous functions, those for which the process of finding limits is essentially trivial. This study will require both some technique in working with absolute values and inequalities and some care for the properties of real numbers, so we will review aspects of precalculus as we go with emphasis on the things we need in calculus.

The derivative is defined as a limit of the difference quotient, an expression with the same form as a calculation of average rate of change. We will use this to derive formulas and rules for finding derivatives that allow us to avoid

using the definition. By the middle of the course you will need to be able to find derivatives using these rules both quickly and accurately, so that technique does not get in your way in later material.

The mean value theorem and its corollaries tell us how to take the information given at a point by the derivative and spread it out over an interval. These corollaries let us use information about the derivative and second derivative to sketch the graphs of functions. Solutions of problems involving finding the maximum or minimum value of a function also depend on differentiation. Derivatives are also used to approximate changes of value of functions resulting from small changes in the independent variable. About a quarter of the course will be spent learning how to apply derivatives of functions to these kinds of situations.

This course concentrates on conceptual understanding, the rigor which characterizes mathematics, technique, and application. Because this is a formal reasoning course we will spend a fair amount of time on why we know that the mathematics works and not just on technique and applications. Students who have had some calculus before should avoid the temptation to rest on the technique they already know: this course is more sophisticated than most high school calculus courses. Those who have not had calculus before should not fear the presence of those who have: you have fewer bad habits to unlearn. This course presupposes no prior study of calculus.

Exams and Grading

We will have a three hour exams (each worth 100 points), two technique quizzes and an essay (totaling 100 points), and a final, (worth 150 points). Tentative dates for the exams and quizzes can be found on the calendar (on line at http://www.iwu.edu/∼lstout/Calculus1/Calc1CalF08.html). Homework will be due every Friday.

My exams always include definitions, examples of how those definitions apply, proofs of theorems, and problems of varying difficulty. Competence in the mechanics of the subject will earn you a C; mastery of the technique and the definitions and reasonable facility with the applications is B work; I expect facility with the theory, mastery of the technique and applications, and clear expression of mathematical ideas for an A.

I will use a straight scale for determining grade. To allow flexibility at boundaries, I reserve the right to change the boundaries, but will draw them no higher than:

A : 90% or over
A-: [87,90)
B+: [83,87)
B : [78,83)
B-: [75,78)
C+: [70,75)
C : [65,70)
C-: [60,65)
D : [50,60)
F : below 50%

Note: The line for passing will not move, the others *may* move downward.

Attendance Policy

I expect you to read the relevant sections of the book before the class where I will be discussing them. Classes and office hours are what you pay tuition for, so take advantage of them. If you don't come to class I will notice your absence and miss you and you will not learn the material with the same emphasis that I put on it. There is no deduction of points for classes missed.

Policy on Academic Integrity

Work handed in for a grade is expected to be your own work. On daily learning there is something to be gained by talking with your fellow students: study groups and/or discussions on the material and homeworks are encouraged in this course. However, you do have to pay special attention of your ability to work independently: understanding the material and being able to solve problems on your own is what you need for quizzes and examinations. All quizzes and exams require all work to be done individually. Any cheating on exams or quizzes will be treated as a violation of the policy on academic dishonesty in the student handbook and will be reported to the Associate Provost.