MA123 Spring 2004

This course syllabus is general information which applies to all students taking Ma123.

There are 450 total points in the course. The information on this page explains how 400 of them are earned. Each instructor will have his/her own class syllabus which will, among other details, explain how the 50 point instructor grade will be earned.

Final Point Totals vs. Final Course Grade

Total Course Points (out of 450)	Final Course Grade
At least 405	A
At least 360	B
At least 315	C
At least 270	D
Less than 270	E

Brief Course Description

A one semester introduction to one-variable calculus intended as a terminal mathematics course for students planning careers in fields other than engineering and the natural sciences.

Class Format

The course is taught in only one class format:

- individual sections in which students meet three hours per week with a single instructor for combined recitation and lecture.

CLASSES USE THE SAME TEXT AND THE SAME WEB-BASED HOMEWORK SYSTEM

ALL STUDENTS IN THE COURSE TAKE THE SAME EXAMINATIONS AT THE SAME TIME.

Assistance outside of class is available to students through scheduled instructor office hours in the Mathematics Resource Center or "Mathskeller" in the basement of the White Hall classroom building. For information on the hours of free tutoring, operation, schedules of services, etc. see the Mathskeller home page at http://www.mathskeller.com

GRADES:

There are **450 points in the course**: three departmental mid-term examinations and one departmental final, each worth 100 points, and an instructor grade worth 50 points.

Exams and Homework (400 points possible)

The first 90 of the 100 points in each departmental examination are assigned on the basis of the common, two-hour examinations. These are assigned on the basis of a "curve" in which the average percentage score among students earning at least 30% on the in-class portion of the exam is adjusted to 75%. If the class average is 75% or greater there is no curve. The maximum possible adjusted score on a curve is 105%. (See several examples below,)

The last 10 of the 100 points on each departmental exam is assigned on the basis of student participation in the departmental, web-based homework.

One homework with lowest score can be dropped during each exam period. There are total four homework dropped in each semester.

Each student has individual, **Personal Version** of the web-based homework assignments which he or she is expected to work and submit the answers on the web. For each problem set there is also a **Common Version** of problems similar to the personal version. Everyone gets the same common version. Problems on the common version are the ones most likely to be discussed in class and recitation

Only work submitted on the student's Personal Version is used to determine his/her Homework Participation Grade

- Students may work with others on the homework in fact this is encouraged.
- There will be scheduled times in the Mathskeller for students to receive assistance with homework See http://www.mathskeller.com/
- A student can submit answers to an assignment any number of times. The system maintains a complete record of all submissions.
- A student receives credit for a problem if he or she submits the correct answer before the homework set expiration date passes. The subsequent submission of an incorrect answer will not cause the student to lose credit for a problem.
- Until the expiration date the homework system will, upon submission, inform students of whether their answer is correct on each problem submitted. After the expiration date the system will also provide the expected answer.
- A student's participation score on a homework set is the percentage of the problems on the set to which he/she has submitted a correct answer prior to the set's expiration date
- A student's participation score for an examination is automatically calculated as an average of his/her participation scores on each of the problem sets assigned for the exam, rounded to the nearest integer
- There are between 3 and 11 homework assignments prior to each examination, each has an expiration or due date prior to the exam on which the material it represents will first be covered. In the case of unforeseen circumstances such as lost class days due to weather, the expiration dates of some assignments could be adjusted – but never to an earlier time. This is highly unlikely!

A student's homework participation points for an exam will be calculated as follows:

Home Participation Score For an Exam	Homework Participation Points on Exam
At least 85%	10
At least 75%	7
At least 60%	5

At least 40%	3
At least 30%	1
Less than 30%	0

The participation grade is something over which students have complete control. Students who choose not to participate fully in this part of the course are choosing to reduce their total number of points and likely their course grade accordingly.

There will be no "curving" of homework participation scores.

Assistance with and collaboration on homework

Students may freely collaborate with others on their homework. The mathematics department provides free homework assistance in Mathskeller. See the http://www.mathskeller.com/

Examples of Examination Grade Calculations:

Student X scores 71% on the in-class portion of an examination. On the exam the average of all papers scoring at least 30% is 68% which implies a 7 point curve. She has an 85.1% homework participation score. The curve shifts her 71% to a 78% and she has earned all of the possible homework points. Her grade on the exam is:

90*.78 + 10 = 70.2 + 10 = 80.2 which is a "B"?

Student Z scores the same 71 % on the in-class portion of the above and has a 74.9% participation grade. He has not reached the 75% threshold so his homework score is 5. His grade on the exam is:

90*.78 + 5 = 70.2 + 5 = 75.2 which is a "C"?

Student Z scores the same 99 % on the in-class portion of the above examination and has a 95% participation score. She can use only 6 of the curve points to meet the maximum 105% so her grade on the exam is

90*.105 + 10= 94.5 + 10 = 104.5 which is an "A"?

Instructor Grade (50 points possible)

Each instructor determines how the instructor grade will be assigned in his or her class. Among the many possible considerations are quizzes, attendance, and class participation.

Tests and Test-Preparation Information

This will be posted when it is available

Examination Room Assignments

- **The Mid-Term Exams Are:**
  - **Exam 1: Wed. Febuary 11, 2004**

- Exam 2: Wed. March 10 , 2004
- Exam 3: Wed. April 14, 2004

- **All Mid-term Exams are From 5:00 PM – 7:00 PM**
- **The Final Exam is: Tuesday May 4, 2004 from 6:00 PM to 8:00 PM**

INSTRUCTOR	SECTION (S)	EXAM 1	EXAM 2	EXAM 3	FINAL

Alternate Examinations:

Students who have university excused absences or who have university-scheduled class conflicts with uniform examinations may arrange with their instructor to take the exam from 3:00 to 5:00 p.m.

1. Students with a scheduling conflict must arrange with their instructor to start the exam early at least two weeks in advance. They must provide the instructor with the conflicting class and instructor. Meetings (including tests) which are scheduled by instructors at times not listed in the schedule of classes are not university-scheduled conflicts.
2. Early exam papers are treated exactly the same as papers from the regular session in grading and normalization (curving) process.
3. **Students who start early agree not leave the early exam room until 5:10 (i.e. after the regular exam has been underway for 10 minutes). Papers of students who leave before the test monitor releases them will be assigned scores of zero on the exam, and potentially expose themselves to charges of cheating on the exam.**
4. **Work-related conflicts are neither university excused absences nor university-scheduled absences.** However, students with work-schedule conflicts may request permission from their instructor to take the early exam. Such requests must be made two weeks in advance and must demonstrate to the instructor's satisfaction that it I snot possible for the student to make arrangements for a work-schedule adjustment with the employer so that he/she can take the exam. Students making such a request must have actually talked to their employer about re-scheduling and the request must be accompanied by the employer's name, business address, and daytime business telephone. The student can expect that the employer will be contacted.

   The alternate examination room has limited seating capacity. Work-related requests will be considered only after valid, on-time university-excused absences and university-scheduled class conflicts are accommodated.

All Alternate exams will be in CB 204

There is no alternate exam for the final

Other Arrangements

Students who are unable to take either the regular or early examination should work with their instructor to see if some hybrid arrangement is possible. For instance in the past students have arranged to come to the early examination an hour late and have an instructor escort them to the regular testing site to work on the exam for another hour. Other arrangements have permitted students to arrive from another class up to an hour late for the regular examination by arranging for a representative of the Ombudsman's office to meet them at the earlier class and escort them to the exam. Like the alternate exam itself, tests taken under these arrangements are treated exactly the same as tests from the regular sessions.

Alternative arrangements such as the above are very rare and of necessity made case-by-case. However together with the regular and alternative exam times they cover almost all excused absences from the regular exams other than serious illness, accident, and university-sponsored travel. Each case falling under such a situation is handled separately with a separate examination created for each individual and then administered by his or her instructor. **Individual tests such as these are totally independent of the uniform exams. They are not scored in the uniform process by which all common exam papers are checked, nor are their grades determined by the normalization ("curving") process applied to the the common exam**. They are written, administered, scored and receive the grade deemed appropriate by the instructor.

General Course Description and Organization

Old Exams of Math 123 online:

To down load the old exams of math 123, go http://www.uky.edu/Libraries/Reserves/, then click on Access Electronic Reserves, click on I have read and understood, click on Math Department (next to MA123), enter dema123 as your User Name, enter oldexam as your Password. There are old exams from fall 2002 to spring 2003.

Course Organization

Ma123 is a three credit-hour introduction to calculus which is primarily intended for students who do not need to take a second calculus course.

- All sections use the same text: Calculus and Its Applications by Goldstein, Lay, and Schneider
- All sections use a common web-based homework system which also provides practice examinations before each exam.
- All students in all sections take the same three mid-terms and one final exam at the same time.
- The Mathematics Department operates the Mathskeller, a mathematics resource center in the basement of White Hall Classroom building where all students in Ma123 can regularly meet with their instructor for assistance and can receive free tutorial assistance prior to each examination and homework expiration date. Ma123 students can use computers in the Mathskeller to retrieve and print their web-based homework at no cost.

The course is defined by specific objectives, listed below.

The web-based homework sets and practice examinations are provided for individual students to test their own levels of mastery of the material specified by the objectives. Students are strongly advised to be sure that they can do these problems and the practice exams as they prepare for the departmental exams.

Course Objectives by Exam

The course is defined by objectives, not simply by sections or topics in the text. The text is one source of information about the course material. It is not always the best. Instructors will often provide alternative approaches to understanding individual concepts and working different types of problems which are dictated by the needs of their students. Students who do not attend class regularly will not receive a comprehensive view of the material.

Note that although there will likely be more weight on more recent material **all exams are cumulative.** Thus, for example, Exam 2 will encompass items 1-27 below

EXAM I: Introduction to the Derivative

Chapters 0, and 1 of the text together with web homework, teacher-assigned homework, and practice tests

1. Students should have problem-solving understanding of the relationship between the geometry of lines in the plane and analytic expressions (i.e. equations) describing them. In particular they should be able to calculate equations of lines from point or point-slope, and information about intersection, parallel and orthogonal relationships. Conversely they must be able to deduce the corresponding geometric information from the analytic."
2. Students should know the quadratic formula and be able to calculate the point(s) of intersection of two quadratics, a quadratic and a line, line and circle, etc.
3. Students should be able to correctly and precisely define/describe the derivative of a function at a point in both geometric and analytic terms. They should understand that the analytic form represents the limiting value of the slopes of secant lines.
4. Students should be able to calculate the derivative of a simple function (linear , quadratic, f(x) = a/(x-b)) at a given point as a limit (i.e. using the analytic definition)
5. Students should know the standard forms of the equation for a circle with a given radius about a given point and should be able to find the tangent line to a circle at a point. That is, they should be able to geometrically (graphically) calculate the derivative of a function of the form f(x) = a +/- sqrt(r^2 – x^2).
6. Students should be able to estimate the slopes of tangent lines to a simple graph and use this information to make a table of estimated values of the derivative of the function.
7. Students should know the basic rules of differentiation (linearity, addition and subtraction rule, constant - multiple rule, and genaral power rule).
8. Students should be able to calculate the derivatives of simple, piecewise defined functions with components of the types described in the previous item. They should know that endpoints can cause problems but are not responsible for end-point behavior of derivative functions.
9. Students should be able to calculate the equation of the tangent line to the graph of any of the functions described in the previous two items.
10. Students should understand that knowing the tangent line at a point is equivalent to knowing the derivative and functional value at that point and be able to exercise this understanding in problem-solving.
11. Students should be able to calculate and graph the derivative of the absolute value (or similar piecewise defined) function.
12. Students should understand that the tangent line is the "best" linear approximation to the curve. Students should understand that the idea of tangent line approximation is simply to replace the function by the tangent line function and ask the question about the latter. Test problems will ask for estimates of functional values.
13. Students should be able to understand and execute informal limit calculations – they should understand that 0/0 and infinity/infinity are meaningless expressions.
    They should know that to exist, limits must exist from both sides.
    They should know the concept of continuity and its proper definition: continuous functions are the ones for which you can actually do the intuitive thing. They should be able to explain in analytic and geometric terms why certain simple functions are or are not continuous at certain points,

EXAM 2: (Application of the derivatives and more derivative rules)

Chapters 3 and 2.1 - 2.4 except optimazation problems of the text together with web homework, teacher-assigned homework, and practice tests

14. More about derivative rules (product rule, quotient rule, and chain rule) and should be able to calculate the derivative of any reasonable polynomial with rational exponents or rational function of such expressions [for test 3 and 4 this extends to expressions involving compositions of exponentials and logs].
15. Students should be able to define and calculate in simple examples the average rate of change of a function over some interval in its domain.
16. Students should understand the interpretation of the derivative as rate of change - and should understand the derivative as the limiting value of the average rate of change. For linear motion they should understand the interpretation of this as the instantaneous velocity at a point and view it as the limiting value of the average velocity over time intervals beginning and ending at that point.
17. Students should understand the relationship between the sign of the derivative and the shape of a curve. They should know that a positive derivative means an increasing graph but should appreciate such things as the fact that it could be asymptotically approaching a constant value and not necessarily become infinite. They should be able to infer the sign and approximate magnitude of the derivative at a point from a sketch of the graph and should be able in simple cases to infer the regions on which the function is increasing or decreasing from the analytic expression for the function.
18. Students should know the general shapes of a few fundamental curves: linear, quadratic, rational, exponential, log, sin and cos, absolute value, etc.
19. Students should be able to properly define relative and absolute maxima and minima and explain the difference.
20. Students should understand the connection between the concavity of the graph and the sign of the second derivative and should be able to use this information in both directions.
21. Students should be able to sketch the graphs of simple analytically described functions and functions for which tabular data on values of the function and its derivatives are provided.
22. Students should know what a critical number of a function is, be able to properly define the concept, and be able to calculate them in simple cases.
23. Students should understand that extrema of a function occurs at critical points but that there need not be a local max or min at a critical point. They should understand that functions need not have maxima and minima on a particular domain and that absolute extrema may occur at end points. They should be able to solve problems using these ideas (first derivative test).
24. Students should know that on an interval the sign of the derivative does not change between critical numbers and should understand why this means that the function must be constantly increasing or decreasing on intervals between critical values. [Note: a full understanding of this idea requires the mean value theorem which is not mentioned in the text. Thus these are to be regarded as facts which can be illustrated with a diagram. Some instructors may elect to discuss this in more depth.]
25. Students should understand that one can infer from the concavity of the graph at a critical point whether a local max or min occurs at that point (second derivative test). They should understand, however that the second derivative may be zero or not exist at a critical point and be able in such cases to use first derivative information (if available) to pick out local extrema.
26. Students should know what a point of inflection is (where the concavity changes) and should understand that it is NOT simply where the second derivative is 0 – (e.g. f(x) = x^4 at x=0, or it may fail to exist).
27. Students should know the interpretation of the derivative as rate of change and be able to apply this to elementary linear motion. They should understand the difference between velocity and speed. They should be able to interpret the sign of the derivative and relate it to terms such as "increasing, decreasing, expanding, shrinking, stationary, etc."

EXAM 3: The exponential and log functions, the integral, and Optimization Problems

Chapters 2.5 - 2.7, 4, 5, 6, 7.1, and 7.5 by substitution only of the text together with web homework, teacher-assigned homework, and practice tests

28. Students should know how to use derivative to find optimization problems' solutions. Students should be able to set up and solve elementary max-min problems in basic geometric, physical, or economic contexts. In particular they must be able to work with the basic distance, area, and volume formulas, and fundamental relationships such as distance = rate*time, profit = income –costs to analyze such problems.
29. Students should understand the relationship between the exponential and log functions and know their derivatives and values at 0 and 1. They should know that e is about 2.7 and that the log of 1 is 0.
30. Students should be able to do elementary exponential growth and decay problems – "how much is left ..." and understand that the model reflects the fact that the rate of change is proportional to the value. They should understand that the log function converts the nonlinear y = Ae^(kt) to lny = lnA + kt which is a linear relationship and easy to solve.
31. Students should be to able complete the sentence "F(x) is an antiderivative of f(x) means .....". They should have some understanding that the antiderivative is unique up to a constant: they should know that if F and G are both antiderivatives of the same function f(x) on an interval containing [a,b] then F(b)-F(a) = G(b)-G(a) . They should be able to explain why this is the same as saying that F =G+c for some constant c. They should understand that this basically requires the function to be defined and continuous on an interval although they will not be expected to expect to deal with that on exams.
32. Students should know the antiderivative for 1/x and exp(x). With regard to the previous item they should be able to understand that f (x) = ln(|x|) if x <0 and ln(|x|) = c if x >0 is also an antiderivative of 1/x.
33. Students should be able to calculate the anti-derivatives of polynomials (including ones with real number exponents) and rational functions with denominator degree 1.
34. Students should know that there no general algebra of the antiderivative other than linearity. They should know to watch their work and be aware that any time they are using a general rule (e.g. int (f*g) = int(f) *int(g) then its almost certainly wrong.
35. Students should understand that integration by substitution comes from the chain rule
36. Students should be able to calculate simple integrals by substitution.

EXAM 4: Final Exam

Definitely integral - Chapters 7.2, 7.3, 7.4, 7.5 by substitution only of the text together with web homework and supplemental material, teacher-assigned homework, and practice final

37. Students should know a definition for the definite integral of a function f(x) over an interval [a,b]. The book defines this as F(b) –F(a) where F is an antiderivative. They should understand that this is a number while the antiderivative is a function. They should be able to interpret this in terms of areas and use this idea to solve problems involving the areas between curves.
38. Students should know that the derivative of the area function (the area under a non-negative function f from a to x) is the function f . This actually requires that the function f(x) be continuous but students will not have to deal with that possibility on an exam. They should understand why this means that the area function differs from any antiderivative by a constant – in particular it satisfies the A(b)-A(a) = F(b)-F(a) permitting areas to be calculated with antiderivatives AND antiderivatives to be calculated with areas.
39. Students should understand the definition, geometric interpretation, and calculation of elementary Riemann sums. They should understand that (under reasonable assumptions) they converge to the (signed) area under the curve and thus to the value of the antiderivative at a point – On exams, Riemann sum calculations will be restricted to small values of n and left/midpoint rules.
40. Students should be able to interpret a Riemann sum in sigma notation and calculate its value in simple cases.
41. Students should understand the application of antiderivatives to the derivation of Newton's laws governing motion without resistance and should be able to do elementary exercises with this idea. That is they should understand that the height (h (t)) of a body experiencing only the force of gravity satisfies h'' (t) = -32 ft/sec^2. They should be able to solve for h (t) = c0 + c1*t -16*t^2 by integrating twice and interpret the constants c0 and c1 as initial position and velocity in the context of simple word problems involving motion under constant acceleration.