

Spring 2007

22M:028 Calculus III  
(Multivariable/Vector Calculus)  
and  
22M:109 Classical Analysis

MWThF 10:30  
Room 105 MLH

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Math Dept. office

14 MLH

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This is one of my favorite courses: The math is wonderful and the students are motivated. Expect to work hard and learn a lot.

Are you prepared for this course?

The prerequisite for this course is second-semester calculus. To me that means *solid knowledge of first and second semester calculus*. If you got an *A* or *B* in Calc II, and work hard in this course, you can realistically aim for an *A* in Math 28. If you got a *C* in Calc II (and especially if you got a *C* in both I and II), then I believe you will have some trouble with Calc III; if you got a *D* in Calc I or II, then I do not recommend Math 28.

Why? Each time we introduce a new idea, we work examples to illustrate/practice/apply it. If you get bogged down in prerequisite material, you won't be able to focus on the new idea. You need to be comfortable and fluent in quick calculations of *easy* algebra, integrals and derivatives (including trig, log, exp).

At the same time, all the core ideas in Calc III are extensions of ideas developed in Calc I. If you have a good understanding of the basic ideas of single-variable calculus, then you should be able to enjoy extending those ideas to multi-variable settings.

Linear Algebra (e.g. 22M:27) is not required for this course; however I view Linear Algebra as a recommended co- (or pre-) requisite. Many ideas from multivariable calculus are echoed by ideas of linear algebra, so each course helps you understand the other. Our text uses matrices and vectors, and teaches the vector/matrix algebra it needs.

Office hours t.b.a. (Meanwhile please see me, email, or phone, to make appointments.)

Text: Vector Calculus (3<sup>rd</sup> ed.) by S. J. Colley

We aim to cover nearly all of chapters 1-6, and part of ch. 7.

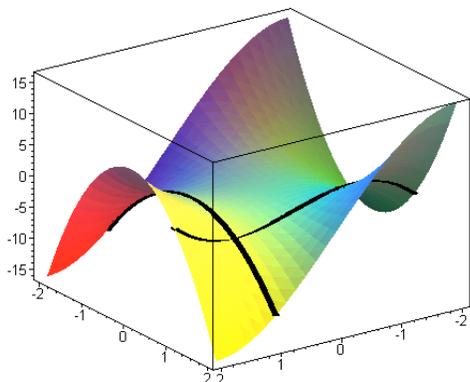
The rhythm is usually one or two days per section (see Schedule).

The overall goals of the course are for you to *understand basic concepts and major theorems of multivariable calculus, and to acquire enough technical skills to use these ideas* in subsequent courses (mathematics or physical/social sciences) and appropriate "real world" situations.

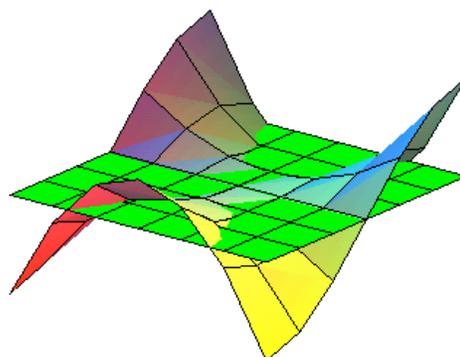
This course **will** make **some** use of **computers**. You do **not** need to know how to program. I will provide handouts and informal guidance to help you learn how to use the package MAPLE, which is available in ITCs around campus. You are welcome to use any other system you know, such as MATHEMATICA or MATLAB. There will be occasional computer homework assignments.

You can see the power of computer visualization in these illustrations of three of the major ideas of multivariable calculus:

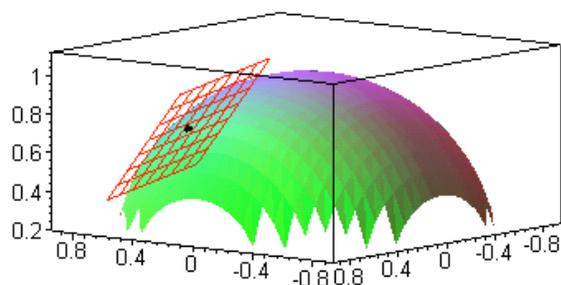
### Slicing



### Stretching



### Linear Approximation



A typical modern calculus text represents hundreds of years of thought and work by a large number of people, some brilliant and some just competent. I believe calculus is one of the great intellectual accomplishments of humankind. On a purely personal level, Multivariable Calculus is one of my favorite of all math courses: The material is powerful in its applications, beautiful in its internal construction and the way it unites different kinds of mathematics (see e.g. Sec. 2.5 for derivatives + matrix multiplication, and Sec. 5.5 for integrals + determinants), and just at the level of difficulty where you have to work to understand it, but the understanding is achievable.

There is a limit to how much of this world we can explore in one semester; so please interpret the phrases *understand basic concepts* and *acquire enough technical skills* with the reservation that this course is an introduction to the subject. Part of the joy and part of the frustration of mathematics is that as much as you learn, there always is more to be learned.

Pace of the course: We have many ideas to encounter, and limited time. So...

- Many topics will be covered, a few skipped or treated very lightly. For exams, I will make clear which sections are the basic requirements.
- **If you miss a class, get the assignment and notes (right away) from another student.** We will move at a rapid pace. Also new material usually builds on what was covered before. And Homework usually gets assigned every day. **Moral: Do not fall behind.** **If you miss a class, get the assignment and notes (right away) from another student.**

**Exams and Homework:** There will be two evening midterm exams and a comprehensive Final

Exam I. Tuesday evening Feb. 20, 7-8:30 pm	(room to be announced)
Exam II. Wednesday evening March 28, 7-8:30 pm	(room to be announced)
Final Exam. Tuesday, May 8, 12-2 pm	(our regular classroom)

Special note: We will not have class on

Wednesday, April 4
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**Homework** will be assigned in class, almost every day, and **collected each Wednesday at the beginning of class.** The policy for **unexcused late homework** is "better late than never": you can submit it up to one week late for half-credit. [Exception: in May, the deadline is Friday May 4.]

The course is not "curved". On each exam, and for cumulative homework, you will receive a grade, and these will be averaged. I will try to design the exams so the scale will be approximately 90 = A, 80 = B, 70=C, 60 = D, and below 58 = F. I will give A+ for averages 95 or above, and A-, B+/-, C+/-, D+ as appropriate. I do not believe in giving the grade "D-" as a passing grade.

I may give you a higher final grade than the strict average. Past justifications include: a student does strong work in all aspects of the course except for one bad midterm; a student's work shows a clear pattern of improvement through the semester; a student's average is near the border between two final grades and her/his class participation has been strong.

There is no formal attendance requirement, but I try to pay attention to who is and who isn't attending regularly, sometimes taking attendance. A student who misses a lot of classes is not likely to receive any special consideration (previous paragraph) in computing the final grade.

Your average will be computed with the following weights:

Midterm Exam I	20%
Midterm Exam II	25%
Final Exam	30%
Homework	25%

**Rules for exams and homework:** All exams are "closed book". **You should have no books, papers or electronic devices (e.g. calculators, cell-phones, iPods) available during exams.**

**If you have an exam conflict, please notify me well ahead of the exam date so we can decide on appropriate arrangements. If you miss a test or assignment because of illness or personal emergency, please discuss the situation with me as soon possible.**

On homework, you need to show work to get credit; simply listing answers (as can be found for some problems in the back of the textbook) will earn zero credit. I encourage you to use whatever tools, such as computers or graphing calculators, that you can use well. It's especially helpful to use a computer etc. to visualize or verify your work. As an incentive, if you use a computer to help with a problem, you can hand in the printout to help justify your answers.

I encourage you to form study groups. Helping someone else understand something is a great way to learn yourself. But ultimately, the work you hand in must be your own. Just to be clear, any instance of plagiarism or other academic cheating will be dealt with as harshly as University rules permit.

Special notes: (1) This Course Description represents my current expectations, and is subject to changes that may be announced in class through the semester. (2) If you wish to contact the Mathematics Department Chair, his office is in 14MLH; to make an appointment, call 335-0708 or see the Department Secretary in 14C MLH. (3) Please inform me within the first week of class if you have a disability that requires special arrangements. Students needing special accommodations should have documentation from the Student Disability Services office. (4) This course is given in the College of Liberal Arts and Sciences; University policies for students enrolled in one college taking courses offered in another may be found at <http://www.uiowa.edu/~provost/deos/crossenroll.doc>.

*My own expectation in this course is that we will deal with each other, and with the course material, in a responsible, professional, honorable way, and that we will enjoy working together this term. I welcome your comments, good or bad, about any aspect of the course, any time during the semester, and in the Student Evaluation forms used at the end.*

Some important thoughts...

"Mathematics is something you do, not something you learn."

(J. Martin - Iowa graduate and my Ph.D. advisor)

*Mastery for Service*

Kwansei Gakuin University school motto