Calculus&Mathematica
Instructors' Manual

Contacts & Links

Mail:

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- All Class Assistants: ca@cm.math.uiuc.edu
- Report Technical Problems: tech@cm.math.uiuc.edu
- Report errors in the courseware: notebookerrors@cm.math.uiuc.edu

Websites:

- C&M website: http://cm.math.uiuc.edu
- ClassComm website**:** http://cm.math.uiuc.edu/classcomm
- Courseware: http://calcand.math.uiuc.edu
- MathEverywhere: http://www.matheverywhere.com

Instructional Videos:

- NetMath (on-line version of C&M) help videos: http://netmath.uiuc.edu/help.php
- Wolfram Mathematica's Learning Center: http://www.wolfram.com/learningcenter/

What is C&M?

Calculus&*Mathematica* is a revolutionary way of approaching teaching mathematics. Traditional Mathematics courses emphasize the learning of mathematics through rote work, memorization, and mastery of hand methods of solving problems. Although this can result in creating a good human calculator, it is not conducive to in-depth and substantive understanding of mathematical concepts.

Calculus&*Mathematica* does away with this traditional approach. Since students use Mathematica software to help them step through the boring routines of traditional mathematical learning, they are free to achieve a better conceptual understanding of the material while still gaining a good knowledge of the methods of problem-solving. The end result is a student who really understands the material he or she is working on.

Many prospective students are concerned that if they take C&M classes, they will not actually learn how to do any of the math, since "The computer does all the work for you." Fortunately, this is simply not true. Students cannot just present a problem to Mathematica and have the computer solve it from beginning to end. They must understand the problem well enough to be able to give Mathematica the right instructions to solve it. In cases where Mathematica has a higher-level function that is capable of doing all the work (such as Mathematica's Integrate command), students learn to break it apart and see how the computer does the work on a lower level. Mathematica is not a magic wand that can be waved at a math problem; it is a tool that requires as much thought and care to use effectively as pencil, paper, and calculator.

Mathematica and Courseware

There is no written textbook students need to buy for the C&M classes. Rather they will need to purchase the latest courseware CD. It contains the electronic files which would be your lessons and homeworks. The files are read using the software Mathematica 7 (version 6 is also acceptable). The old version Mathematica 5 is not compatible with later versions.

The courseware CDs can be purchased on-line at http://www.matheverywhere.com or bought in the bookstores. Make sure the students purchase the version of the courseware for Mathematica 6. It is compatible with Mathematica 7. Everything purchased before Summer 2007 (both courseware and Mathematica) uses Mathematica 5.2 which is now obsolete and incompatible. The bookstores stock the old versions sometimes, so be careful.

As an instructor you are entitled to get a free copy of the courseware and the Mathematica software. To get Mathemativa go to http://webstore.illinois.edu/ and search for Mathematica. Select the [Departamental license] version. Once installed register on-line. You should receive your password via e-mail in a day. Make sure you are running version 7.

For the courseware go to http://calcand.math.uiuc.edu and find your class. Make sure you are selecting Mathematica 6 courseware. Note this on-line repository is not password protected, but can be legally accessed only by instructors and students in possession of the physical CD.

The most common cause of confusion among students is caused by not understanding the differences between courseware and Mathematica. Clarify that, and make sure they are using current versions of Mathematica (7 or 6 but not 5) and the courseware (labeled as v6).

Course Policies and Guidelines

C&M instructors have the freedom to pick their course policies depending on their teaching preferences. However, there are a few general guidelines we would like you to stick to, so that all C&M courses offer similar experiences for the students. At the end of the manual you can also find actual syllabi for the C&M courses.

- Lecturing

  Regularly held discussions should be a small fraction of all class time (20%-30%). If you feel that the majority of students are struggling with a concept, arrange a discussion or a mini-lecture (20-30min.) Make sure the students have seen the lesson in the lab environment before you discuss it in class.

- Group Work:

  In C&M classes, it is strongly suggested that students work in pairs on the homework. This engages students in group work and saves time on grading. Students you notice always working by themselves are often students in trouble. Encourage student conversation and group work. Advise against splitting up the homework (each student does only half of it).

- Homework Assignments:

  Students' work on the Give it a Try problems is the heart of the course. These assignments should be given 5 to 7 days to complete. They should be graded promptly and returned to students. All instructors should grade at least some of the student homework, and Teaching Assistants should grade up to half of each assignment, depending on the class size.

- Tests :

  Tests (midterms and final) are hand-written and do not use the Mathematica software. Literacy Sheets should serve as an example of problems that are suitable for tests. Make sure students use Literacy Sheets as guides to studying for the written exams. You can even assign written homework or quizzes from them. Alternatively you can hand out a copy to the students and work them out in group discussion sessions. Instructors should use the Literacy Sheets as a guide to making the tests. Do NOT test on topics or types of problems not presented in the lessons or discussed in class.

- Grades:

  Typically 40 to 50% of the course grade is based on the GiveItATry assignments that the students turn in regularly. In the 3 credit hour courses, two tests are usually given and in the five credit hour course,

two or three tests are usually given. If you are worried about special cases where students perform exceptionally on homework but show poor understanding on the written tests, you might try the following policy: The course grade is bounded by +/- one (or one third) of a letter grade around the combined exam grade.

Class Assistants

Class assistants(CA's) are Calculus&Mathematica students who have previously taken the course you are teaching. They know what the course is all about and are experienced in using Mathematica. They can help you see the class through the eyes of the students, so do not hesitate to ask them for opinions.

During the time in the computer lab your class assistant will walk around the lab and help students along with you. If the class assistant cannot answer a student's question, engage both the student and the CA in discussion of the problem.

Class assistants will also help grade homework. As a rule of thumb you should not make your CA work more than 10 hours a week (including class time). If you think your CA is overwhelmed you can ask for relief grading.

ClassComm

ClassComm is the online system C&M classes use for communication with the students. It is found at

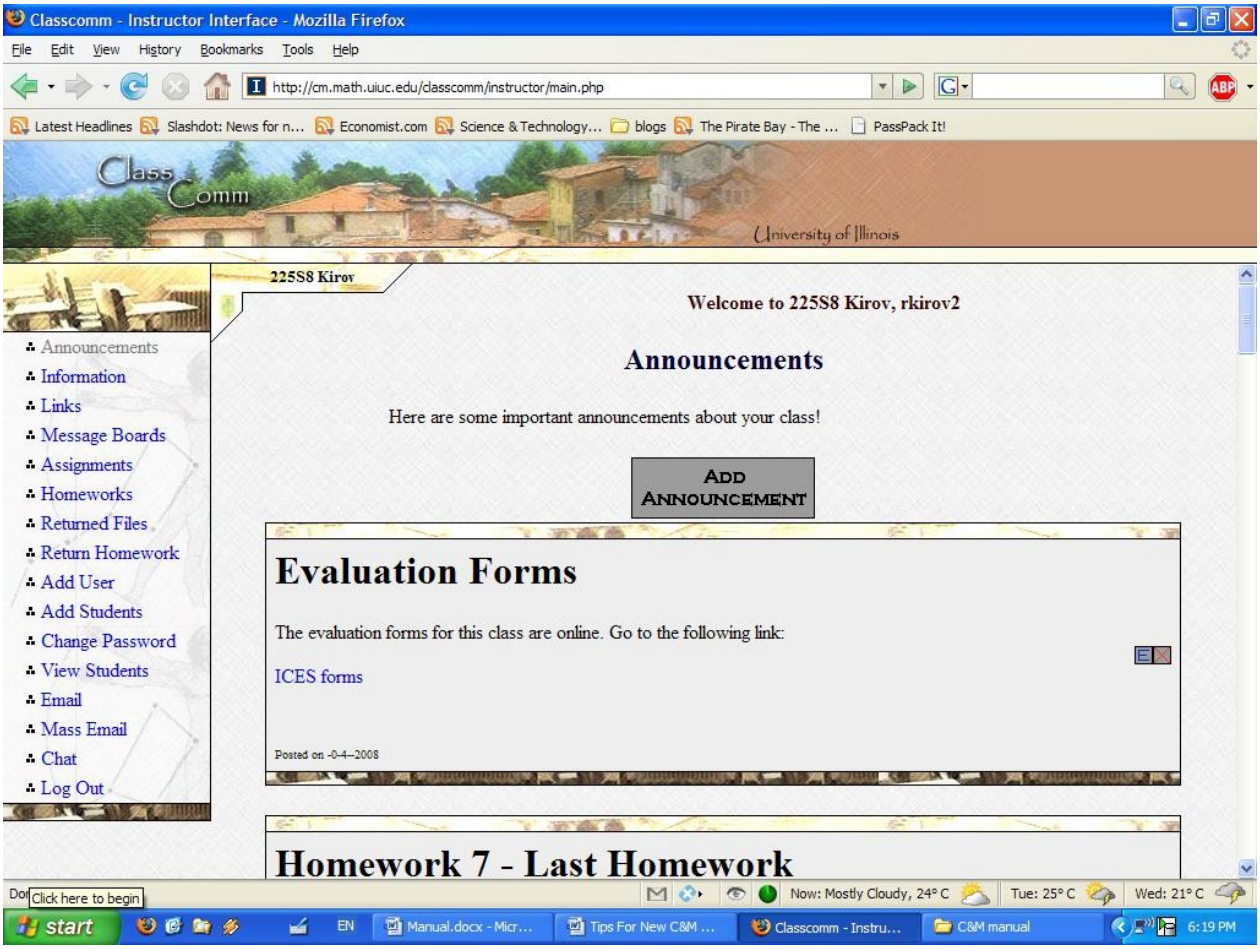
http://cm.math.uiuc.edu/classcomm

Once you are given a C&M assignment you can log in with the following username/password:

Username: (your usual UIUC name)
Password: (same as the username)

In my case this would be:

Username: rkirov2
Password: rkirov2



As soon as you log in the first time, change your password. You should see a screen like that.

- Announcements
  Here you can put text or HTML messages that students will see first when they open ClassComm. It is a good habit to put an electronic version of every type of spoken announcement you make in class here.
- Information
  Same as Announcement but not the default page when students open ClassComm. Anything written here is rarely checked by students. This is a good place to put an electronic copy of the Course Policies/Syllabus for the course.
- Links
  Place to put links to online resources. You can also put a link to the Course Policies/Syllabus for the course.
- Message Board
  Rarely used by students, mainly due to its obsolete interface. Still make sure you check it or clearly inform students not to use that feature.
- Assignments
  Here you need to add any assignment you give to your students. State the section and problems assigned. Once you add items here, students can upload their files to it. Any submission is checked against the assignment date. If a homework is submitted late it will be marked as such.
- Homeworks
  Here you can see the files students submitted to each assignment. Download it from here and grade it.
- Returned Files
  Here you can see all the returned files per assignment.
- Return Homework
  Here you can return homework files once it is graded.
- Add User
  You can add a student here, so they can access your class. Make sure the Access field says – “Student” and Mentor/Grader says –“N/A”. In the beginning of the semester you need to add your CA too. She/he needs to be identified as such in the Access field. Once created the student password is the same as the user name. Make students change it.
- Add Students
  Same as Add User, but provides option to add 20 students at a time. Use this in the beginning of the semester, to create the student accounts in ClassComm from your Class Roster page in Enterprise.
- View Students
  You can check here for the last time the user logged on. This is useful for identifying inactive students.
- Mass Email
  Useful for making email class announcements

Electronic Texts/Syllabi

- MATH220(Calculus I), uses the Calculus&Mathematica CD
    - 1.01.Growth
    - 1.02.Exponential
    - 1.03.Growth Rates
    - 1.04.Rules
    - 1.05.Tools
    - 1.06.DiffEq
    - 1.07.Races
    - 1.08.DiffEq2
    - 1.09.Parametric Plot
    - 2.01.Measure Area
    - 2.02.Fundamental Formula
    - 2.03.Measurements

- MATH231(Calculus II), uses the Calculus&Mathematica CD
    - 2.04.Transform Integrals
    - 2.05.2D Integrals
    - 2.06.More Tools
    - 2.07.Pat Procedures
    - 3.01.Splines
    - 3.02.Expansions
    - 3.03.Use Expansions
    - 3.04. Taylor's Formula
    - 3.05.Convergence
    - 3.06.Power Series

- MATH241(Calculus III), uses the Vector Calculus&Mathematica CD
    - VC.00.Reference Lessons
    - VC.01.Vectors
    - VC.02.Perpendicularity
    - VC.03.Gradient
    - VC.04.Trajectories
    - VC.05.2DMeasurements
    - VC.06.Sources
    - VC.07.Transform 2D Integrals
    - VC.08.Transform 3D Integrals
    - VC.09.Spherical
    - VC.10.3D Measurements

VC.11.3D Flowalong

- MATH225(Matrix Theory), uses the Matrices, Geometry&Mathematica CD
  - MGM.00.PlotFest
  - MGM.01.PerpFrames
  - MGM.02.MatrixAction
  - MGM.03.MakeMatrix
  - MGM.04.SVD Analysis
  - MGM.05.3D
  - MGM.06.Beyond 3D
  - MGM.07.Roundoff

- MATH285(Differential Equations), uses the DiffEq&Mathematica CD
  - DE.01.Exp
  - DE.02.OscDiffEq
  - DE.03.Laplace-Fourier
  - DE.04.DiffEq Issues
  - DE.05.First Order
  - DE.06.System Flow
  - DE.07.Linear
  - DE.08.Linearize
  - DE.09.HeatWave

- MATH415(Linear Algebra), uses the Matrices, Geometry&Mathematica CD
  - MGM.00.PlotFest
  - MGM.01.PerpFrames
  - MGM.02.MatrixAction
  - MGM.03.MakeMatrix
  - MGM.04.SVD Analysis
  - MGM.05.3D
  - MGM.06.Beyond 3D
  - MGM.07.Roundoff
  - MGM.08.Subspaces
  - MGM.09.EigenDynamics
  - MGM.10.Spectral Theorem
  - MGM.11.Function Spaces

- MATH461(Probability), uses the ProbStat&Mathematica CD
  - Prob.01.Simulations
  - Prob.02.Data Analysis
  - Prob.03.Probabilities
  - Prob.04.More Data Analysis
  - Prob.05.NormalExponential

Prob.06.Random Variables
Prob.07.Joint Conditional
Prob.08.Central Limit
Prob.09.Counting
Prob.10.Statistics

Example Syllabi/Course Policy Sheets

For your information, you can find 3 sample syllabi at the end of this manual. You are not required to follow them, but they can provide useful pointers when you are writing the syllabus for your class.

Math 241 E8 – Vector Calculus

1 - 2 pm Monday, Tuesday, Wednesday & Thursday
August 22 - December 13, 2007

Instructor: Radoslav Kirov
Email: rkirov2@uiuc.edu
Office: Altgeld Hall 178
Office Hours : will be announced later and by appointment

Class Assistant: Paul Koehring
Email: pkoehri2@uiuc.edu

Location: The class will usually meet in Altgeld 239 computer lab. Exams and traditional lectures/discussions will take place in Altgeld 245.

Required Course Material: There is no book you need to buy for this class. Rather you will need to buy the latest courseware CD *Vector Calculus & Mathematica*. It is available online at www.matheverywhere.com. The version sold in the bookstores oncampus is obsolete, so don't buy it and return it if you have already done so. The courseware is available online, but you can legally use it only if you have purchased the CD.

Homework: There will be approximately eleven homework assignments assigned from the "GiveItaTry" files after each chapter. Homework will be collected weekly through the course webpage:

cm.math.uiuc.edu/classcomm

Students should work in pairs on the homework. Submit only one assignment per group. Do not forget to put both names at the top of the file. Homework will be due Thursday at midnight, unless noted otherwise. Late homework will not be accepted unless you provide a legitimate excuse.

Exams: There will be two in-class exams and a cumulative final exam. The use of calculators and computers will not be permitted during the exams. I will announce the date and location of each exam on ClassComm at least one week before the exam. Remember to check ClassComm for these announcements each day at the beginning of class. You will use the "LiteracySheet" files as preparation for writen exams.

Grading: Your final grade will be computed as follows:

Homework	45%
Exam I	15%
Exam II	15%
Final Exam	25%

Grading Scale: The following grading scale will be used, unless the average is too low, in which case there will be a curve at the end of the semester.

Grade	Percentage
A	90% – 100%
B	80% – 90%
C	70% – 80%
D	60% – 70%
F	0% – 59%

Labs and Mathematica: You will need to spend additional time outside of class for the reading and homework. Mathematica 6 should be accessible on some computer labs (ME LAB, Grainger, FLB, IH 24). Additionaly, you can work at home if you own a copy of Mathematica. You can purchase Mathematica for $25 from the University at `www.cites.uiuc.edu/software`

Don't forget to use the new version 6, not the old one 5.2, since they are not compatible.

Always backup your work! Computer problems is not an acceptable excuse for late homework.

Math 290: The department recognizes that learning Mathematica is worth an extra hour of credit. It takes no extra work and your grade will be solely based on your average homework grade. To register, go to the Undergraduate Math office in room 313 AH and request a form to add Math 290, have it signed by me and then return it to 313 AH.

Math 116 Section D8
http://cm.math.uiuc.edu/classcomm

Fall Semester 2003
11-12 MWF

Instructor: Debra Woods
Class Assistant: XXXXXXX
Lab phone: 244-7618
e-mail: dwoods2@uiuc.edu

Office Hours: I am always willing to meet with you; talk to me or send me email to set up a time. Additionally, I will be around for at least a half hour before class each day, and after class if you need me.

Message board: There is a Math 116 message board link on our class homepage. Please check it daily, check messages and post messages.

Class Meetings: We will meet every Wednesday in 241 Altgeld to discuss the previous week's homework and what will be on the next quiz. When discussion is done, we will go into the lab. Quizzes and tests will also be in 241 Altgeld. Detailed information is available at the web address above.

Homework: Assignments and their due dates will be posted in the Assignments section of Classcomm. If some problem occurs that prevents you from getting it in on time (computer crashes, brain crashes, whatever), send an email, telling me what the problem is and how soon you expect to get the assignment in. Because of the nature of this course, it is vital you don't fall behind in the assignments and so late homework will be penalized. I will assign points for style and clarity as well as correctness of the solution, so put in text cells explaining what you are doing.You will be encouraged to work together on homeworks. Both partners will be expected to contribute **equally** *to each problem*.

Late homework will be accepted until I have finished grading existing homework. In practice, this will mean some weekends you will have to work but others you will not.

Quizzes and Tests: We will have several quizzes, two tests and a final project. The tests will be comprehensive. If you are unable to make it to a test, let me know ahead of time so that we can make other arrangements.

Grades: Your grade will be decided *roughly* in the following way:
homework 60%, quizzes 10%, tests 20%, final 10%.
The final grade is subject to the condition that you cannot score more than one letter grade higher than you do on your exam average.

99-100 A+	93-98 A	90-92 A-
88-89 B+	83-87 B	80-82 B-
78-79 C+	73-77 C	70-72 C-
68-69 D+	63-67 D	60-62 D-

Less than 60 is an F

Math 220
Course Syllabus

Recommended texts:
Calculus&*Mathematica* by Davis, Porta and Uhl.

The course is designed so that you can learn by exploring the text interactively using *Mathematica* rather than by reading a text or listening to lectures. Learning math by discovering it yourself is an essential aspect of this course.

The course syllabus includes the following lessons from the electronic text:

Feel of Mathematica	1.07 Races
1.01 Growth	1.08 Diffeq 2
1.02 Exponential	1.09 Parametric Plots
1.03 Growth Rates	2.01 Measuring Area
1.04 Rules	2.02 Fundamental Formula
1.05 Tools	2.03 Measurements
1.06 Diffeq	

Each computer lesson consists of three parts: Basics, Tutorials and Give It A Try.

In these sections, new concepts are explained then applied to problems and finally you are asked to solve several problems on your own.

We'll spend most of our class time working through the computer lessons and assignments. I've found that written worksheets that guide you through some of the course material are sometimes useful too so we'll spend class time on these occasionally.

Discussion of the things you are learning is an essential part of this course. For this reason you are **encouraged to work in groups** and to turn in group homework assignments. Form groups of two or three students today and work through today's assignments.

Complete English sentences should be used to explain your solutions to the Give It A Try questions. By explaining your work I hope that you will learn to use the vocabulary of math 220 and provide yourselves with study aids written in your own words. Think about what you want to say and reread problems after you finish them.

This is a mathematics class not a computer programming class. The Calculus and Mathematica lessons are carefully written so that you do not need to remember a lot of *Mathematica* commands. It is much easier to copy and paste commands that you need within the lessons and then make minor changes to the commands.

Your comments, criticisms, questions and suggestions will be welcome throughout the semester.