

# Math V1202: Calculus IV

Fall 2009

**Time and place:** Tuesday--Thursday 1:10--2:25, in 203 Mathematics.

**Instructor:** Robert Friedman (x4-4355, Office 605 Mathematics).

**Office hours:** Mondays, 2--3 in 605 Mathematics, but feel free to drop by at any time.

**Email:** [rf@math.columbia.edu](mailto:rf@math.columbia.edu)

**Teaching Assistants:** 1) Chenyan Wu [chenyan@math.columbia.edu](mailto:chenyan@math.columbia.edu)

Office hours: M 3--5, T 3--4, M 3-4 in 405 Mathematics (the small room inside the Help Room), if available, and in the Math Help Room otherwise, and M 4--5 and T 3--4 in the Math Help Room;

2) Srinivas Chivukula [sc2692@columbia.edu](mailto:sc2692@columbia.edu)

Office hours: M 11--1 in the Math Help Room;

3) Paul Rodgers [pjr2113@columbia.edu](mailto:pjr2113@columbia.edu)

Office hours: MW 10--11 AM, in the Math Help Room.

This is a fourth semester calculus course. Prerequisites are Calculus I -- III or the equivalent. In particular, you should be familiar with standard techniques of differentiation and integration and with the basic properties of functions of several variables, including partial derivatives. The last part of the course assumes some familiarity with complex numbers (although these will be reviewed) as well as Taylor series.

The course begins with integration of functions of two and three variables. Next, we study the calculus of vector fields: the various differential operators (grad, curl, div) that can be applied to a function or vector field, types of integrals of vector fields (line integrals, surface integrals), and the fundamental theorems (Green, Stokes, divergence or Gauss) relating differentiation and integration of vector fields. The last part of the course is an introduction to the theory of functions of a complex variable. This theory is important in many applications of mathematics, physics, and engineering, and draws upon the material of the first two thirds of the course.

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**Text:** James Stewart, *Calculus: Early Transcendentals*, **sixth edition**, Thomson Brooks Cole, 2008. Available at the University bookstore.

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**Homework:** There will be weekly problem sets, due at the beginning of class on Tuesdays. The first problem set will be due on Tuesday, September 15. **You should attempt every homework problem and eventually understand how to do every problem correctly.** Collaboration and discussion with your classmates is encouraged, but you **must** write up assignments individually. **Calculus IV is much more demanding than previous calculus classes. Students who resort to copying their homework from their classmates, a solution manual or the Web almost invariably come to grief on the exams.**

Due to the large size of the class, some five or six randomly chosen homework problems will be graded each week, but you should make sure that you know how to do all of them. Graded homework will be available on the table outside 605 Mathematics. No late homework will be accepted.

**Quizzes:** There will be five in class quizzes, of which the lowest will be dropped. The tentative dates for the quizzes are September 22, October 20, November 10, December 1, December 8 (all dates Tuesdays).

**Exams:** There will be two 75-minute midterm exams and a final. The tentative dates for the midterms are as follows:

- **First Exam**, Tuesday, October 6, in class
- **Second Exam**, Tuesday, November 17, in class
- **Final:** this is centrally scheduled by the University. The tentative date and time are Tuesday, December 22, 1:10--4 PM, in 203 Mathematics. It *must* be taken at the scheduled time.

If you have two final examinations scheduled at the same time, it is the responsibility of the other department to provide an alternate exam. Examinations will not be rescheduled because of travel arrangements -- it is your responsibility to schedule travel appropriately. Makeup midterms will be given only under exceptional circumstances and you will need a note from a doctor or a dean.

**Grading:** The final course grade will be determined by:

Homework: 10%

Quizzes: 10%

Midterm exams each: 20%

Final exam: 40%.

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**Help:** My office hours are Mondays 2--3 in 605 Mathematics, but you should also always feel free to make an appointment or just drop by. Help is also available without appointment in the [Mathematics Help Room](#) (406 Mathematics) whenever it is open. The Help Room is staffed both by faculty and teaching assistants, who will be able to help you with questions related to this course.

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**Academic Dishonesty:** The vast majority of students do not cheat. Anyone who does so devalues the hard work of the rest of the class and creates a bad atmosphere for all. Anyone found to have cheated on a quiz or exam will receive a failing grade for the course and be subject to administrative discipline. If you are struggling with the material or have a problem about a specific exam, please discuss it with me instead of resorting to cheating.

**Important dates:**

September 8: First day of class

October 6: First midterm exam

October 13: Drop date  
 November 2--3: Election break  
 November 17: Second midterm exam  
 November 26--27: Thanksgiving break  
 December 10: Last day of class  
 December 22: Final exam

[Master University Examination Schedule](#)  
[University Academic Calendar](#)

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## Homework:

This schedule is tentative and may be modified as necessary. Please check here for each week's reading and homework.

Date	Reading	Homework
Sep. 8, 10	15.1, 15.2, 15.3: Double integrals; General regions.	<b>HW#1 due Sep. 15:</b> <b>15.1:</b> 1, 2 <b>15.2:</b> 4, 10, 12, 20, 22, 26, 30 <b>15.3:</b> 2, 6, 12, 18, 20, 28, 48
Sep. 15, 17	15.4, 15.5: Polar coordinates; Applications.	<b>HW#2 due Sep. 22:</b> <b>15.4:</b> 6, 8, 16, 28, 36 <b>15.5:</b> 6, 12, 16, 24
Sep. 22, 24	15.6, 15.7, 15.8: Triple integrals; Cylindrical and spherical coordinates. <b>Quiz 1 September 22.</b>	<b>HW#3 due Sep. 29:</b> <b>15.6:</b> 2, 4, 12, 16, 22, 36 <b>15.7:</b> 16, 18, 22 <b>15.8:</b> 8, 10, 12, 18, 26, 44
Sep. 29, Oct. 1	15.9: Change of variable; Review.	<b>HW#4 due Oct. 6:</b> <b>15.9:</b> 2, 6, 20, 24
Oct. 6, 8	<b>First Midterm Oct. 6;</b> 16.1 Vector Fields.	<b>HW#5 due Oct. 13:</b> <b>16.1:</b> 2, 6, 10, 11--14, 15--18, 24, 26
Oct. 13, 15	16.2, 16.3: Line Integrals; Fundamental theorem for line integrals.	<b>HW#6 due Oct. 20:</b> <b>16.2:</b> 2, 6, 8, 12, 20, 28, 40 <b>16.3:</b> 4, 6, 8, 12, 16, 18
Oct. 20, 22	16.4, 16.5: Green's theorem; Curl and divergence. <b>Quiz 2 October 20.</b>	<b>HW#7 due Oct. 27:</b> <b>16.4:</b> 2, 4, 6, 14, 18 <b>16.5:</b> 2, 4, 14, 16, 26, 32

Oct. 27, 29	16.6, 16.7: Parametric surfaces; Surface integrals.	<b>HW#8 due Nov. 5:</b> <b>16.6:</b> 4, 6, 22, 24, 40, 44, 46 <b>16.7:</b> 10, 14, 20, 24, 40, 44
Nov. 5	16.8: Stokes' theorem.	<b>HW#9 due Nov. 10:</b> <b>16.8:</b> 2, 4, 6, 10, 16, 18
Nov. 10, 12	16.9: Divergence theorem; Review. <b>Quiz 3 November 10.</b>	<b>HW#10 due Nov. 17:</b> <b>16.9:</b> 2, 4, 12, 14, 18, 24, 26
Nov. 17, 19	<b>Second Midterm November 17;</b> Complex Numbers.	<b>HW#11 due Nov. 24:</b> <b>Appendix H:</b> 2, 6, 10, 12, 26, 30, 38, 44, 46
Nov. 24	Complex Functions. <u>Complex Functions</u>	<b>HW#12 due Dec. 1:</b> Problems in Handout 1.
Dec. 1, 3	Complex Functions 2: Cauchy- Riemann Equation. <u>Complex Functions 2</u> <b>Quiz 4 December 1.</b>	<b>HW#13 due Dec. 8:</b> Problems in Handout 2.
Dec. 8, 10	Complex Functions 3: Contour Integrals and Cauchy's Theorem. <u>Complex Functions 3</u> <b>Quiz 5 December 8.</b>	<b>HW#14 due December 15:</b> Problems in Handout 3.
Dec. 22, 1:10 PM	<b>FINAL EXAM</b>	