

Math 251:07-09 — Spring 2001

TF3 PH-111

Prof. Bumby

Special announcement. Recitations normally meet on Wednesday (periods 3, 4, or 5) on Busch Campus as announced in the schedule, but all recitation classes on Wednesday, January 17, will be held in Computer Lab ARC-119 instead of the regular classroom.

Office hours. My office hours on Busch Campus are sixth period on Monday, Tuesday and Wednesday in **Hill 438**. These are *drop-in* office hours. If these times are not convenient, appointments may also be made for other times at that location. I read electronic mail almost every day, so that is the most reliable way to contact me: the address is *bumby@math* from any machine in the *rutgers.edu* domain. You may also leave telephone messages, or catch my ear if I am in the office, by phoning 445-0277.

Textbook. The text for the course is James Stewart, *Calculus: early transcendentals* (fourth edition), Brooks-Cole, 1999 (ISBN 0-534-36298-2). This course covers chapters 12–16.

Final Exam. The official schedule says that the final exam for this lecture section will be given on Friday, May 04, 8–11 AM. It is likely to be in the regular lecture room, but changes may be announced within the last two weeks of the term. A complete schedule of all Mathematics Department final exams should be posted on the Web with a link from the department home page

<http://www.math.rutgers.edu>

when it becomes known.

The final exam will cover material from the whole course. It will contribute about $\frac{1}{3}$ of the course grade.

Class exams. There will be four exams, one at the end of each topic, during the term instead of the usual two. Since the exams cover less material, there will be a little time before each exam to allow everyone to get settled, during which there will be announcements and a brief description of what the next batch of lectures will cover. The whole course will be covered by the time of the fourth exam at the beginning of the last week of classes. Exams will be returned at the last lecture, which will be devoted to an overview of the whole course. The exam dates tentatively scheduled for Tuesday, February 06; Friday, March 02; Tuesday, April 03; and Tuesday, April 24. Details will be posted on a Section Web Page. If you must miss an exam, let me know immediately. The pace discourages the use of make-up exams, but an attempt will be made to find an equivalent of the scheduled exam. Note that the entire content of the course will be covered by these exams. The four class exams will contribute about $\frac{1}{3}$ of the course grade.

Maple. There will be one practice and four graded projects on the use of *Maple* to illustrate the ideas of the course. These will be assigned at approximately two-week intervals, and the lab report will be due two weeks after it is distributed.

Recitation work. Only even numbered problems will be assigned. They are intended to illustrate possible exam questions. The solution of these assigned problems will be an important part of the recitation class. Your preparation for doing these problems may include doing some nearby odd numbered problems and checking your answers. The examples in the text should give you an idea of how the solution should be organized. The time between exams is short enough that you will need to work at solving problems as soon as a topic is introduced. A portion of each class may also be devoted to “workshop” problems and discussion of the *Maple* projects. The remaining $\frac{1}{3}$ of the course grade will be based on these projects.

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Here are the topics to be covered in the lectures on Chapters 12 and 13 leading to an exam on February 06.

Date	Section	Page	Problems
January 16	12.1	787	8, 12, 16, 18.
	12.2	794	18, 20, 24, 26.
January 19	12.3	802	4, 6, 8, 16, 20, 40, 42, 44.
	12.4	809	2, 4, 6, 8, 26, 28.
January 23	12.5	818	2, 4, 6, 8, 10, 12, 28, 36, 38.
January 26	13.1	842	8, 10, 12.
	13.2	848	4, 6, 10, 14, 20, 24, 26.
January 30	13.3	855	2, 4, 12, 14, 16, 22.
February 02	13.4	865	10, 14, 30.

Section 12.1 introduces the distance formula in three dimensions. This leads to problems dealing with the various forms of the equation of a sphere, which are well suited for exam questions.

The treatment of vectors in this course is more geometric than the treatment in a Linear Algebra course. The **direction** of a vector can be defined as a unit vector parallel to the given vector. Several notations for vectors are introduced, which will be used freely throughout the course.

Section 12.3 introduces the term **vector projection** of a vector \mathbf{b} on the vector \mathbf{a} , denoted $\text{proj}_{\mathbf{a}} \mathbf{b}$, for the perpendicular projection of \mathbf{b} on the direction of \mathbf{a} . This is necessarily a vector parallel to \mathbf{a} . A *scalar projection* of \mathbf{b} on \mathbf{a} , denoted $\text{comp}_{\mathbf{a}} \mathbf{b}$ (the notation is derived from the alternate terminology **component** of \mathbf{b} along \mathbf{a}), is also introduced. The absolute value of $\text{comp}_{\mathbf{a}} \mathbf{b}$ is the length of $\text{proj}_{\mathbf{a}} \mathbf{b}$, and $\text{comp}_{\mathbf{a}} \mathbf{b}$ is negative if the angle between \mathbf{a} and \mathbf{b} is obtuse. This construction is important, so you can expect to see it on the exam, expressed in this notation.

The cross product of section 12.4 is a construction that is peculiar to three dimensions, but it allows an efficient organization of computations in a way that respects the underlying geometry. An important application produces a vector perpendicular to the plane containing two vectors.

Section 12.5 fixes the terminology associated with equations of lines and planes and contains many examples of how those equations are found from geometric information.

The problems selected from section 13.1 are those that can be done without computer assistance, but the study of curves with *Maple* will appear later.

Section 13.2 finally gives a taste of the Calculus of vector functions. The derivative will be used immediately. However, the integral defined here is of only minor interest. The useful generalizations of the Fundamental Theorem of Calculus relating derivatives and integrals don't appear until Chapter 16.

Section 13.3 is the most significant section in this part of the course. The topic of *arc length* is so important that a great effort has been made in textbooks to locate examples that will lead to integrals that can be found in closed form — suitable for exams. Some of these are surprising. This section also gives several formulas for curvature, and it is important that you be able to use *all* of them. Concentrate on learning to *use* the formula, rather than memorize it. You will be given the arc length formulas on the exam, but no additional clues on using them.

Section 13.4 serves mainly to illustrate 11.8. No problems from sections 16.6 and 12.7 will be assigned at this time. These sections will appear later when we are ready to use the topics they contain. If there is time, there may be a brief discussion of these sections in a lecture devoted to a neighboring section.