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M 273.01: Multivariable Calculus

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Syllabus: M 273 Multivariable Calculus, Spring 2018

Catalog Description: Offered autumn and spring. Prereq., M 172 or 182. Calculus of functions of several variables; differentiation and elementary integration. Vectors in the plane and space.

Learning Goals: Upon completion of this course, a student will be able to:

1. Compute dot and cross products, and work with equations of lines, planes, cylinders and quadric surfaces;
2. Find formulas for vector-valued functions and space curves; compute their derivatives, arc length, and curvature; and describe the motion of particles along space curves;
3. Compute limits, partial derivatives, directional derivatives and gradient vectors of functions of several variables;
4. Find tangent planes to surfaces, and use tangent planes/linear approximations to estimate the function value near a given point;
5. Use the chain rule, find extreme values, and solve constrained optimization problems with Lagrange multipliers;
6. Compute double and triple integrals, including in polar, cylindrical and spherical coordinates;
7. Compute line integrals and use the Fundamental Theorem of Line Integrals;
8. Use and understand Green's Theorem, and curl and divergence of vector fields;
9. Calculate surface integrals, and use Stokes Theorem and the Divergence Theorem.

Instructor: Greg St. George

Office: Math 313 Phone: 243-4146 e-mail: gregory.stgeorge@umontana.edu

Website: The moodle system will be used to list homework assignments and as a document repository.

Text: James Stewart, *Multivariable Calculus; Concepts and Contexts* edition 1. Brooks/Cole Publishing Company. 1998. ISBN: 0-534-35509-9

Note that this book is 19 years old. It is still in print (8th edition?) but when I was selecting the book, Amazon's price for a new copy was \$183 (as of 20 Jan. it had fallen to \$170.) But the subject at the level of the course has not changed in the last fifty years. So I decided you use the 1st edition. If you not receive a book in the lottery and if buying one is a financial hardship, please contact the instructor. I would suggest using bookfinder.com (just enter the ISBN given above in the search screen). As of the weekend before the beginning of the semester there are 11 copies available for less than \$10, and 11 more for between \$10 and \$20. (Another bookfinding site is used.addall.com, but recently this has not done as well as bookfinder.com). Since it can take a week for a book to arrive, there are two copies on reserve. One is a "thick" copy which also contains the Calculus 1 & 2 material, but the Multivariable book, with the same page numbers, is included at the end of this tome.

Office hours: To be announced

Schedule: We will do the material in chapters 9–13 (The Multivariable book, which is a continuation of the Calculus 1& 2 books of the same series, begins with Chapter 8; this material is included in our M 172). These will be done pretty much in order. The instructor will add additional material which is not available in the text. A student who is not attending class should not assume that the book represents everything that will be covered in class, or that he/she is responsible for.

Grading: The course consists of not only the material in the assigned sections of the text, and the homework problems, but also any material added in class. We will have three tests, and these will be announced at least three class periods in advance. All quizzes will be announced at least a day in advance, and there will be a comprehensive final at the end. The final will be given according to the final schedule usually available somewhere on the Provost's website. Extraordinary performance on the final may, at the instructor's discretion, be the basis for raising a grade.

The score of the lowest test will be dropped, if this helps your average. If illness or other exigency requires the a student to miss a test; then that test will be the one dropped. If a second test is missed, a note from a doctor, the health service or other authority must be offered before a makeup will be prepared.

Software and Calculators: No calculators, or other electronic devices, will be allowed on tests.

Grading Scale: The cutoffs for A is 0.9, for B: 0.8, for C 0.65, for D: 0.55. Plusses and minuses will be used, the increment is usually about 3 points. (e.g. to get a B+ the cutoff will be around 0.87.)

Accommodation. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors and Disability Services for Students (DSS). If you think that you may have a disability adversely affecting you academic performance, and you have not already registered with DSS, please contact DSS in Lommassen 154. I will work with you and DSS to provide an appropriate accommodation.

Academic Honesty: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.

Student Conduct Code: All students need to be familiar with the Student Conduct Code. The Code is available for review online; Search for "Student Conduct Code" via the "A to Z Index" link on the UM home page, at present at the upper right corner.)

Other Resources &c. There are obviously many places where lectures on this material can be found on the web. You are encouraged to use them. In addition to the two copies of the text on reserve, there is also a copy of both the instructor's and the student's solution manuals.

A text that the instructor considers to be mathematically superior to our text is: *Vector Calculus* by Marsden and Tromba. This opinion is not shared by most students. There are many different editions; the instructor was able to obtain an 'international edition (not for sale in the U.S.!) at a very reasonable price from India.

A very good book, but more oriented toward physics is David Bressoud's *Second Year Calculus: From Celestial Mechanics to Special Relativity*. Another book, informal and oriented to electromagnetic theory is *div grad curl & all that* by H. M. Shey.

The classic text used by the generation before the instructor was *Advanced Calculus* by R. Creighton Buck. This is still an excellent book, though its emphasis is quite different from the approach in our text.