Math 20-a: Multivariable calculus

Course Syllabus (subject to change)

Summer 2024, Session II

Instructor: Rebecca Rohrlich (rebeccarohrlich@brandeis.edu)
Session Dates: July 8 - August 9, 2024
Class Days: M, T, W, Th
Class Time: 1:50 pm - 4 pm
Classroom: Goldmsith 317
Instructor's Office: Goldsmith 306
Office Hours: T,Th 11 AM - Noon
Textbook: Multivariable Calculus, James Stewart, 8ed

General Course Information: This subject of this course is mulivariable functions and multivariable calculus. Topics covered include: several variables, vector-valued functions, partial derivatives and multiple integrals, extremum problems, line and surface integrals, Green's and Stokes's theorems. Emphasis on techniques and application.

Course Prerequisites: Single variable calculus (Math 10ab or equivalent) and linear algebra (Math 15a or equivalent). With regard to calculus, we will extend the techniques in single variable calculus to multivariable functions. You are expected to be familiar with basic rules of differentiation and integration of single variable functions. With regard to linear algebra, we will make constant use of vectors as a language for geometry. You are expected to know dot and cross products, and projections of vectors onto lines and planes, as covered in sections 12.1-12.4 of the book. As the course goes on you will need to understand linear functions and matrices, and determinants.

Course outline (subject to change):

- Parametrization of basic geometric objects: line, plane, cylinders and quadric surfaces (approx half a week, Ch 12.5, 12.6).
- Vector functions (approx half a week; Ch 13)
- Partial Derivatives (approx 1 week; Chapter 14)
- Multiple Integrals (approx 1 week; Chapter 15)
- Vector Calculus (approx 1-2 weeks; Chapter 16)

Learning Goals:

- Extend the definition of derivative and integral to vector functions.
- Understand and compute partial derivatives.
- Understand the graph of a multivariable function through level curves and tangent planes.
- Understand and compute directional derivatives.
- Define and determine differential and gradient of a multivariable function.
- Compute double and triple integrals.
- Learn about vector fields and how to compute line integrals.
- Define conservative vector fields and understand path independence.
- Apply Green's theorem to solve integration problems.
- Learn the statment of Stoke's and the divergence theorem, (apply Stoke's theorm to solve integration problems).

Grading:

- Homework: 40%
- Quiz: 30%

- Final: 30%

Homework: Homework problems will be assigned every Monday, and must be submitted before the start of class the following Monday. About five randomly selected problems from each assignment will be graded, each problem will count 10 points toward the total grade. Another 10 points will be given based on the completion of the rest of the homework.

You are encouraged to discuss the Homework problems with your classmates, but you must write your own solution. You are not permitted to copy someone else's solutions or solutions from other resources. Your work should be neat and complete – so that partial credits can be given. Late homework will not be accepted, because this is unfair to the grader.

Quizzes: We will have a quiz every day (except the first day). The quiz consists of 2 problems is graded out of 10 points. You get 8 points for writing your name – basically an attendence grade – and 1 point for each problem. Quiz solutions will be posted online later that day.

Final Exam: There will be a final exam on the last day of class. In general, there will be no make-up exams in the course. However, in complex and unusual circumstances which are beyond your control, a make-up exam may be given on 2 a case-by-case basis. This will require providing a detailed account of the situation and supporting documents. If you are unable to attend an exam you should notify me via e-mail as soon as possible and at least 1 week before the exam. Approval in these cases is at the sole discretion of the instructor.

Accessibility Support: If you have a disability for which you are or may be requesting an accommodation, please talk to me as soon as possible.

Academic Integrity: Academic integrity violation related to any academic work will not be tolerated. You should follow Section 4 of Rights and Responsibilities for all University policies on academic integrity. Cases of alleged academic dishonesty will be forwarded to the Department of student rights and community standards. Sanctions can include failing grades and/or suspension from the university.