MUSA 74: Transition to Upper Division Mathematics
University of California, Berkeley Spring 2021

Instructors: Katie Lamar, Chris Randall, Bryce Goldman

Course Email: musa74decal@gmail.com

Course Website: https://musa.berkeley.edu/musa74.html

Lecture: Monday 2-4pm

Discussion: Friday 3-4pm

Location: Zoom

Note: All lectures, discussions, and office hours will be held online utilizing zoom or discord. We plan to record all lectures and discussion sections which will be made available to you within 24 hours. Attendance is not mandatory.

Office Hours: TBA

Discord: Once you are enrolled in the course, you will be given access to our MUSA 74 discord page. We will hold office hours and the weekly discussion section on discord. You will be able to ask questions and answer your peer's questions on discord as well. Please don't post or request entire solutions to homework problems. If you are stuck on a homework problem then first identify which portion of the problem is causing confusion and ask a specific question on discord that will help clarify the concepts.

Bcourses and Course Material: Course Announcements, course material, and all assignments can be found on our MUSA 74 bcourse page. Once you are enrolled in the course, you will be able to access the page. The MUSA 74 Course Notes can be found on the MUSA 74 bcourse page as well. The course notes may be edited throughout the term and additional exercises may be added as well. You will be notified if any changes do occur. The course will follow the MUSA 74 Course Notes very closely and your problem sets will be made up of the exercises found throughout the text.

Enrollment: We will have a first-come, first-served enrollment policy, pending exceptional cases. We will provide more information on how to enroll very soon.

Optional Texts:
The following is a list of various interesting and useful books that may be helpful throughout this course. You can find most of these texts online or in the UC Berkeley Mathematics and Statistics Library.

Calculus Texts:

- Tom Apostle, *Calculus Volume 1: One Variable Calculus with an Introduction to Linear Algebra*

- Tom Apostle, *Calculus Volume 2: Multi-Variable Calculus and Linear Algebra with Applications to Differential Equations and Probability*

- Jerrold Marsden, Anthony Tromba, *Vector Calculus*

Discrete Mathematics Texts

- Kenneth Rosen, *Discrete Mathematics and its Applications*

Analysis Texts

- Walter Rudin, *Principles of Mathematical Analysis*

- Kenneth Ross, *Elementary Analysis*

- Charles Pugh, *Real Mathematical Analysis*

Algebra Texts

- David Dummitt, Richard Foote, *Abstract Algebra*

- Michael Artin *Algebra*

Course Overview:

The transition from lower division to upper division mathematics courses can be quite daunting even to a very experienced student. Unlike other subjects, the difference between lower and upper division courses in mathematics can be quite overwhelming; the two main culprits being writing proofs and abstract concepts. In this course we will address these issues head-on. In particular, we will learn how to write proofs while developing good mathematical style. We will also give students more familiarity with the mathematical objects appearing in Math 104 and Math 113.

MUSA 74 is a **2-unit class** which is intended for students who have no familiarity with writing proofs, and aren't sure if they're prepared enough for upper-division classes. In particular, we strongly recommend that the class is taken alongside Math 53, 54, or 55. We officially assume no prerequisites other than a little calculus (at the level of Math 1A), though we will also appeal to Math 53, 54, and 55 for a few examples. In order to ease the transition, we plan to focus on more of the abstract concepts found in calculus, linear algebra, and differential equations. We will delve into these concepts further by focusing on the proofs that arise when constructing these ideas. By the time you complete this course, you will be comfortable with writing proofs at the level required by the core upper-division sequence of Math 110, Math 113, Math 104, and Math 185.

We want to encourage a welcoming and inclusive learning environment. Questions, curiosity, and collaboration are all highly encouraged, and dismissive attitudes are strongly discouraged. Math is a difficult subject, and confusion is not a sign of weakness. If students would like help outside of class, they are highly encouraged to ask the course facilitators to meet one-on-one. The course facilitators also hold office hours that can be found here, https://musa.berkeley.edu/office.html.

Student Learning Outcomes:

1. Students will be able to read and write proofs at the level of a strong upper-division mathematics major.

2. Students will be comfortable utilizing the language of mathematics in various settings including asking questions and collaborating with peers in upper division mathematics courses.

3. Students will have the skills necessary to read and work through an undergraduate mathematical text.

4. Students will be familiar with naive set theory, field theory, advanced calculus, and other topics of their choice at a level appropriate for an upper-division mathematics major.

5. Students will be familiar with many important proof techniques, including but not limited to casework, contradiction, induction, and compactness.

MUSA 74 Corequisite:
Students are expected to also be enrolled in Math 53, 54, and/or 55 along with MUSA 74. If you aren't enrolled in Math 53, 54, and/or 55 and you still want to enroll in MUSA 74, please reach out to one of the instructors.

Grading Policy:

Homework (50%) Lecture Attendance Quizzes (30%) Discussion Assignments (20%)

Grade: Passed . . . . 70% or above

Grade: Not Passed . . . . Below 70%

A grade of incomplete will only be given when the student is unable to complete the required work due to exceptional circumstances (illness, accident, death in the family, etc.), and their work up until that point has been satisfactory (passing).

Lecture Information and Attendance Policy:
Lectures will be held on Zoom (Mondays 2-4pm) and will be centered around introducing new material. We will record each lecture and attendance is not mandatory; however there will be a bcourse quiz on the new material. The quiz will open at the end of lecture (Monday at 4pm) and will be due by Tuesday at 4pm. We will only grant extensions if there are extenuating circumstances (emergency, technical difficulties, etc.). Please contact course staff via bcourses or the course email (musa74decal@gmail.com) if you need an extension.

Discussion Information and Attendance Policy:
Discussion sections will give you the opportunity to apply the concepts you've learned in a group setting. We will hold these discussion sections online via Zoom and Discord. Attendance is not mandatory and the discussion recording will be made available to you. You will be required to submit the discussion assignment on bcourses by 11:59pm on Sundays. We encourage you to watch or attend Friday discussion sections since we will go over the assignment in great detail at that time. The assignment will be graded based on correctness and you will have the opportunity to work in groups. Bourses will allow you to choose your group each week and each group will only have to submit one assignment. We will provide multiple opportunities for everyone to find a group during the first few weeks of class. **You are not required to work in a group nor will you be required to stay in the same group for the entire semester.**

Homework Policy
Problem Sets will be released on the first Monday of each unit and they will be due on the first Monday of the start of the following unit on Bcourses. Please visit https://docs.google.com/spreadsheets/d/1koKfFvO2OJ9721hG_43a3r-U3gSyPMbgr9dIduxCPgo/edit?usp=sharing for more details regarding homework deadlines. Problem Sets will be graded on both completion and accuracy. If you believe that there is a grading error on one of your problem sets please contact us as soon as possible. You will have two weeks from the due date of the assignment to request a re-grade. Lastly, if you use other resources or you collaborate with another student to complete your problem set, please indicate so on your problem set. We encourage you to work with one another and seek out additional resources; however, we won't tolerate plagiarism. For example, you are encouraged to discuss solutions, but the write-up should be individual.

Important Dates:

First Day of Class . . . . .January 19, 2021

Last Day to Add/Drop . . . . .February 10, 2021

Last Day of Class . . . . April 30, 2021

DSP Accommodations:
If you need any type of accommodations throughout the semester, please contact one of the instructors as soon as possible and be sure to provide a copy of your DSP Accommodation Letter.

Academic Honesty
The Mathematics Department, and in particular, the instructors in this course, expect that students in mathematics courses will not engage in cheating or plagiarism. The following has been adapted from the Math Department web page to suit our course.

What does cheating mean?
Broadly speaking, cheating means violating the policies of a course or of the university in order to gain an unfair advantage over fellow students. A particular kind of cheating is plagiarism, which means taking credit for someone else's work. Cheating and plagiarism hurts your fellow students in the short term, they hurt the cheater in the long term, and they will not be tolerated. Instructors can easily spot when problem sets look unusually similar, or have similar (wrong or correct) answers, calculations, ideas, or thought structure. If you write the correct answer to a computational problem without any justification or with a bogus justification leading to that answer, this raises strong suspicions that you cheated, on top of not receiving any credit anyways due to the lack of correct justification. We encourage MUSA 74 students to collaborate on problem sets and seek out additional help from tutors, online resources, and other texts. If you use other resources or you collaborate with another student to complete your problem set, please indicate so on your problem set. We encourage you to work with one another and seek out additional resources; however, we won't tolerate plagiarism.

What to do in a case of cheating?
If you suspect that other students are cheating, you should immediately inform one of your instructors. Students may be cheating in ways that the instructors have never even heard of before(unlikely, but possible). Even if you don't mention any names, the sooner you inform the instructor what is going on, the sooner they can take measures to put a stop to it. You can further report any cheating at: http://sa.berkeley.edu/conduct/reporting/academic.

Resolution to cheating.
If you are suspected of cheating, the instructor may pursue a variety of actions depending on the particular nature of the incident. If you accept responsibility for academic misconduct, the matter can often be resolved between you and the instructor with possible academic sanctions ranging from losing points on a problem set to failing the class. The instructor may also send a report to the Mathematics Department and/or Center for Student Conduct. It is not necessary for the instructor to determine whether the student(s) has a passing knowledge of the relevant factual material. It is understood that any student who knowingly aids in cheating is as guilty as the cheating student.