

MATH 318: Introduction to Calculus of Several Variables

Spring 2021

- **Instructor:** Meric Augat – maugat@wustl.edu
- **Office Hours:** TBA
- **Class Time:** MWF 4PM in St. Louis
- **Classroom:** Online only

- **About the course:** In this course, we will see an introduction to differential and integral calculus of functions of n -variables making some use of matrix algebra. The topics which we will cover include vectors in \mathbb{R}^n , the basic language of point-set topology, functions, limits, and continuity, the derivative, and hopefully at least the Inverse/Implicit Function Theorems. Time permitting, we may address other topics such as optimization or manifolds and integration over manifolds. The course is at a level of rigor intermediate between that of Calculus III and upper level analysis courses.

- **Structure:** Each week I will record at least one lecture video for each day of class (this is an almost necessary step due to time zone issues). Each Monday and Wednesday of the week during the assigned class time, I will have office hours/discussion periods to go over lecture material, etc. Each Friday of the week during the assigned class time, there will be an explicit open discussion period aimed at facilitating group discussion. Since we will often have assignments due on Sundays, I want to encourage everyone to openly discuss aspects of the course and the assignments – I have no issue with open discussion of the homework and quiz problems as long as everyone is actively participating. I will do my best during these Friday sessions to act merely as guide, and I expect you – the students – to lead the discussion.

This structure is a small experiment, and if I find the Friday sessions are not going as I had hoped, then I will modify things to try and get the results I want – whether that is scrubbing the idea in total, or introducing an incentive/disincentive for certain behavior.

- **Prerequisites:** Math 233 and 309.

- **Textbook:** *Multivariable Mathematics*, by Theodore Shifrin. Each lecture of the class is based on one or more sections of the textbook. I strongly recommend reading the relevant part of the textbook before each lecture.

- **Other Recommended Texts:** As with any mathematics course you are highly encouraged to explore other texts. *Calculus of Several Variables* by Brian E. Blank is available on Canvas; you may print it out as desired – please respect the author’s requests on page 4; in particular, **posting the book online is not allowed**. Another text (which may be too rigorous) is *Calculus on Manifolds* by Michael Spivak – it addresses any material we cover in this course at a more theoretical level. Moreover, many of the topics we cover in the first few weeks will be covered by any introductory real analysis text, however they typically do not address multivariable analysis in the same context.

- **Recommendations:** It is not enough to simply watch lecture videos and attend discussion sessions! Mathematics can only be fully understood if you are an *active* participant in it! It is hard to overemphasize how important it is to work through the topics and material on your own. Understanding a topic or idea is a reward from having struggled through examples and problems. I am a strong believer in approaching mathematics the way it is discovered: through examples. Paul Halmos once said,

The heart of mathematics consists of concrete examples and concrete problems. Big general theories are usually afterthoughts based on small but profound insights; the insights themselves come from concrete special cases.

Your approach should be no different! Exploring concrete examples and especially counterexamples (or even non-examples) is critical to a complete understanding of the course material. I recommend doing as many exercises as you can on your own, finding additional exercises, etc.

- **Assignments:** There will be bi-weekly homework assignments as well as Quizzes assigned for weeks 3, 7, 11 & 15. All assignments are to be done remotely and submitted online at Canvas. Homework will consist of 40% of the final grade, while each Quiz consists of 15% of the final grade.

The assignments will be posted online on Canvas, and you should upload your solutions there. Your uploads must be a .pdf file. The problem set of each week is due on **Sunday** of that week at **10:00PM** (in St. Louis). If you miss the deadline, you can submit your assignment late with a late penalty of 20% per day. Depending on the length of the problem set, a random subset of problems may be chosen to be graded rather than the entire assignment.

All submissions to Canvas must be a .pdf file. Please be aware of this and learn how to scan your work so that it is a .pdf file. If you have any questions about this, please contact me *before* any assignments are due and we can figure out what works best for you.

- **Letter Grade:** Your final letter grade will be computed based on the following weighted combination of your exams and homework grades.

Quiz I	Quiz II	Quiz III	Quiz IV	Homework
15%	15%	15%	15%	40%

The letter grade distributions are as follows:

Range	Grade		
[97, $+\infty$)	A+	[76, 79)	C+
[92, 97)	A	[72, 76)	C
[89, 92)	A-	[69, 72)	C-
[86, 89)	B+	[66, 69)	D+
[82, 86)	B	[62, 66)	D
[79, 82)	B-	[59, 62)	D-
		[0, 59)	F

For Pass/Fail, a score of $[66, +\infty)$ is Pass and $[0, 66)$ is a Fail.

- **Schedule:**

Week	Dates	Assignments Due	Notes
1	1/25–1/29		
2	2/1–2/5	Problem Set 1	PS1 Due 2/7
3	2/8–2/12	Quiz 1	Q1 Due 2/14
4	2/15–2/19	Problem Set 2	PS2 Due 2/21
5	2/22–2/26		
6	3/1–3/5	Problem Set 3	PS3 Due 3/7, Wellness Day – 3/3
7	3/8–3/12	Quiz 2	Q2 Due 3/14
8	3/15–3/19	Problem Set 4	PS4 Due 3/21
9	3/22–3/26		
10	3/29–4/2	Problem Set 5	PS4 Due 4/4
11	4/5–4/9	Quiz 3	Q3 Due 4/11
12	4/14–4/16	Problem Set 6	PS6 Due 4/18, Wellness Day – 4/12
13	4/19–4/23		
14	4/26–4/30	Problem Set 7	PS7 Due 5/2
15	5/3	Quiz 4	Q4 Due 5/10

This calendar is subject to change throughout the semester.

- **Disability Services:** If you require accommodations for a disability which affect your work during the exams or the class, please contact the Office of [Disability Resources \(DR\)](#) promptly to discuss appropriate arrangements.