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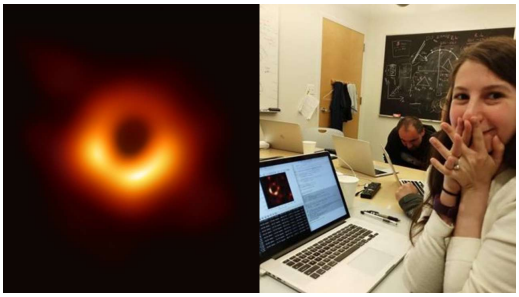
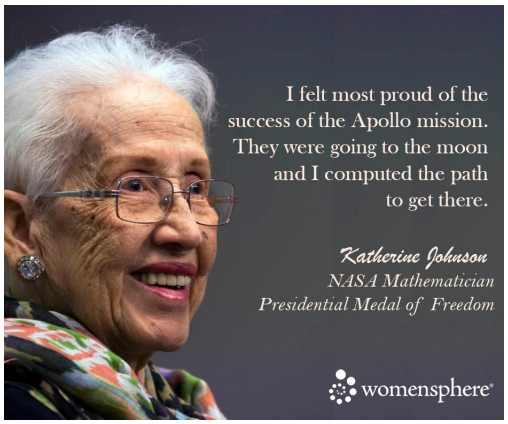
Office Hours: Wed 10-10:50am, Th 2-2:50pm
and by appointment (via Zoom)





Welcome to Differential Geometry! In this course we will apply multivariable calculus, differential equations, and linear algebra to the study of curves and surfaces in $\mathbb{R}^3$. We will consider concepts such as curvature, the shortest path between two points on a surface, and non-Euclidean geometries. Differential geometry is fundamental to a number of fields in physics and mathematics including Einstein's theory of relativity, used to study black holes and the shape of our universe.

Course Website: https://ccle.ucla.edu/course/view/20F-MATH120A-1

Course Format: The course will consist of a mix of pre-recorded video lectures, recorded live lectures, live discussions, and group work. You will generally submit assignments online via Gradescope. I will post course announcements on CCLE. A good way to communicate with your peers outside of class is through Campuswire. Links to Zoom, Gradescope, and Campuswire are posted on the CCLE site.

Although you may complete much of the course work on your own time, it is important to keep up with the course content and deadlines, so as not to fall behind. This is both for your own sake, as well as that of your peers and instructors. There will be frequent check-in assignments to help keep you on track. I recommend creating designated times each week for watching videos, reading the textbook, and working on assignments. I also encourage you to maintain a consistent schedule for eating, sleeping, and exercise.

I anticipate students will encounter some technical difficulties and personal challenges, particularly in the midst of the global pandemic. I expect you to do your best to prepare for challenges and to turn assignments in on time. For example, you should start uploading each assignment well before the deadline. However, I realize there may be some extenuating circumstances. Three check-ins and one homework assignment will be dropped, no questions asked. Further accommodations may be made on a case-by-case basis. In general, I can be much more accommodating if you contact me about a problem earlier rather than later. Please email me if you are experiencing difficulties completing course work due to external factors out of your control.

Class Meetings: MWF 2:00-2:50pm via Zoom (See Zoom tips for UCLA students). After the first meeting, we will often only meet live on Mondays and Wednesdays. Parts of these meetings will be recorded. Other parts will not be recorded in order to facilitate active discussion and group work. You are encouraged to attend, but attendance is not required particularly if your time zone or other circumstances interfere. Any materials related to the meetings will be posted on CCLE.

Discussions: Tuesdays 2:00-2:50pm via Zoom with Alexander Kastner.

Prerequisites: C- or better in Math 32B, Math 33B, Math 115A, and Math 131A, or equivalent.

Textbook: The textbook is *Differential Geometry: A First Course in Curves and Surfaces,* by Theodore Shifrin, available free online. We will cover roughly Chapters 1 and 2.

Grading: Grades will be determined by the following:

- 10% Check-ins
- 25% Homework
- 35% Midterms
- 30% Final Exam

Letter grades will be assigned according to the scheme:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	0-59

Check-ins: Check-ins will be short assignments that are due frequently, roughly 2-3 times per week. They will generally consist of follow-up questions from a video lecture or reading. These are intended to help you stay on track in the course and reflect on your learning experience. Check-ins will be submitted via Gradescope. **The first check-in is due in Gradescope Sunday, October 4th by 11:59pm.**

Homework: Written homework will be handed in each week via Gradescope, usually due by 2pm on Fridays. If you click on the Account tab in Gradescope (bottom left), there is a "Getting Started" guide. You will upload a PDF file of your work to Gradescope, either by scanning hand-written notes, uploading a file from a tablet, or using LaTeX to output a PDF.

Exams: There will be two midterm exams and a cumulative final exam. The tentative dates for the midterms are below. The final exam is scheduled by the registrar. All exams will be administered online and submitted via Gradescope. Once they are posted, you will have 24 hours to complete the exams and upload your solutions. You are not expected to spend more than 1 hour on a midterm exam or 3 hours on the final exam. The 24-hour window is intended to accommodate varying schedules and time zones.

Midterm Exam 1:	**Friday, October 30**	(Week 4)
Midterm Exam 2:	**Friday, November 20**	(Week 7)
Final Exam:	**Wednesday, December 16**	(Week 11)

Course goals: A successful student in this course will be able to calculate curvature, torsion, and the Frenet frame for curves; parametrize surfaces; calculate the first and second fundamental forms for a surface; calculate Gauss and mean curvature of a surface; make rigorous arguments about differential geometric objects; and determine the validity of technical statements about differential geometric objects.

General Expectations/Study Tips:

- An atmosphere of mutual respect, kindness, and encouragement. Be the type of person you would like to turn to when you are in need of help.
- Learning is a process. In the words of Napoleon Hill *"Strength and growth come only through continuous effort and struggle."*
- Form a study group with others in the class. The best way to learn something is to try to explain it to someone else. You can use Campuswire to form study groups.
- Go over your notes after each class/video. Explain to yourself or someone else what the lecture was about, what the key ideas were, and how the examples work.
- Read ahead in the book. It helps a lot to have already seen the material covered in class, even if you do not understand everything the first time through.
- Reading math is not like reading a novel, you may need to read a section in the book multiple times before you understand it.
- If you are having trouble with the course material, I expect you to ask for help. You are encouraged to come to my office hours and to your TA's office hours.
- Show all your work and justify your reasoning on homework and exams. If I do not understand what you have written for a problem, you will not get credit for it. Aim to communicate your mathematical ideas rather than just get correct answers.
- If you need to contact me via email you should write **Math 120A** in the subject line or I may not receive it.

Student Conduct: Violations of the student conduct code can result in a failing grade on any course work related to the violation, a failing grade in the course, and/or suspension. Cheating includes, but is not limited to

(a) looking at another student's exam during a quiz or test,
(b) copying the work of another person and submitting it as your own, and
(c) using any materials except those explicitly approved during a test-taking situation.

For more information, see the Student Conduct Code at
https://www.deanofstudents.ucla.edu/studentconductcode.

Accessibility: Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310) 825-1501 or the CAE Website. In order to ensure accommodations, students need to contact the CAE within the first two weeks of the term.

Tentative Schedule:

Week	Date	Sections
0	Fri 10/2	Intro
1	Mon 10/5 Wed 10/7 Fri 10/9	Chapter 1: Section 1 - Curves
2	Mon 10/12 Wed 10/14 Fri 10/16	Chapter 1: Section 2 - Frenet frame
3	Mon 10/19 Wed 10/21 Fri 10/23	Chapter 1: Section 3 - Global theory of curves
4	Mon 10/26 Wed 10/28 **Fri 10/30**	Chapter 2: Section 1 - Surfaces **Midterm Exam 1**
5	Mon 11/2 Wed 11/4 Fri 11/6	Chapter 2: Section 1 - First fundamental form
6	Mon 11/9 **Wed 11/11** Fri 11/13	 **Veterans Day - No class**
7	Mon 11/16 Wed 11/18 **Fri 11/20**	Chapter 2: Section 2 - Gauss map **Midterm Exam 2**
8	Mon 11/23 Wed 11/25 **Fri 11/27**	Chapter 2: Section 2 - Second fundamental form **Thanksgiving Holiday - No class**
9	Mon 11/30 Wed 12/2 Fri 12/4	Chapter 2: Section 3 - Gauss equations
10	Mon 12/7 Wed 12/9 Fri 12/11	Chapter 2: Section 4 - Geodesics
11	**Wed 12/16**	**Final Exam**