Course Syllabus

Math 19B: Calculus for Science, Engineering, and Mathematics

Winter 2024
MWF 1:20-2:25pm
Jan 8, 2024-March 15, 2024

Instructor: Marcella Gomez (she/her/hers)
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Office Hours: BE 569, Mon 10-11:15am (other times may be made available upon request)

I. Description:

The definite integral and the fundamental theorem of calculus. Areas, volumes. Integration by parts, trigonometric substitution, and partial fractions methods. Improper integrals. Sequences, series, absolute convergence and convergence tests. Power series, Taylor and Maclaurin series. Students cannot receive credit for both this course and MATH 11B, or AM 11B, or AM 15B, or ECON 11B.

Requirements

Prerequisite(s): MATH 19A or MATH 20A or AP Calculus AB exam score of 4 or 5, or BC exam score of 3 or higher, or IB Mathematics Higher Level exam score of 5 of higher.

II. Course Aims and Outcomes:

Aims

    a. Develop a basic understanding of integrals, how to compute them, how to interpret them, and how to approximate them.
    b. Understand the differences between sequences and series and determine convergence properties.
    c. Know how to find series approximations of continuous functions and corresponding error approximation.

Specific Learning Outcomes:

1. Understand the relationship between integrals and the area under a graph.
   - Understand the definition of the definite integral as the limit of a Riemann sum
   - Understand that continuity is a sufficient but not a necessary condition for integrability on a closed interval.
   - Be able to interpret the definite integral in terms of sums and differences of areas.

2. Understand the fundamental Theorem of Calculus and how areas under graphs can be calculated using the concept of the antiderivative of a function.

3. Understand the definite and indefinite integral concept.

4. Learn how to find the antiderivatives of elementary algebraic and trigonometric functions.

- Understand the methods of substitution, integration by parts, partial fraction decomposition and when to use them.

5. Applications of the integral.
   - Understand how to apply the integral to finding volumes using Cavalieri's Principle.
   - Understand how to find volumes using the method of disks and washers or the method of cylindrical shells.
   - Understand the application of the integral concept to the concepts of work and energy in physics.

6. Understand the definition of improper integrals.

7. Apply the integral to determine the arc length of graphs and surface area of surfaces of revolution.

8. Understand Taylor polynomials and the Taylor remainder formula.

9. Understand infinite series, power series and Taylor series.
   - Understand what a sequence is and how sequences can be defined as a function or recursively.
   - Understand arithmetic and geometric sequences and series.
   - Define what an infinite series is, and be able to apply standard convergence tests to determine whether a given series converges or not.
   - Be able to calculate the Taylor series of a function about a point, both analytically and using symbolic mathematics; understand and (as appropriate) be able to compute its radius of convergence.

III. Textbook/Materials/Requirements:
1. Text: *Calculus*. Jon Rogawski.
2. Materials required include access to computer and internet*
3. Assignments: 9 HWs, 2 projects, 9 quizzes, 1 midterm, 1 final

Any edition of the Rogawski text can be used. A pdf version will be provided through Canvas. To ensure consistency, HW problems will be typed up instead of given as problem numbers out of a textbook. This is to facilitate access to a textbook at an affordable price. Utilizing a textbook is strongly encouraged, since it will serve as an anchor point for the course. Supplemental materials are also encouraged but please be cautious when using online resources.

*Loaner Laptop Program
For graduate and undergraduate students who do not have a functioning laptop and/or are struggling with poor or no internet, please follow the contact methods below. For a program overview, visit Slug Support.
   - Preferred method: email the Dean of Students office at deanofstudents@ucsc.edu
   - Alternative method: phone the Dean of Students office at 831-459-4446 and leave a detailed voicemail including name, student ID, and a telephone number at which they can be reached.

Student Hours: Students in this class will be expected to work about 15 hours per week (3hrs/unit; 5 unit class) on the course material, including 3h15 in class with the instructor, 1h5 in section, 1 hour in office hours (with either the instructor, TA, or learning services) to ask questions as necessary, 1 hour with your study group, and finally, 8h40 hours per week of

reading, working analytically and/or using software to understand the materials and on homework problems. Reading material on your own and reviewing solutions is essential to understanding gaps in knowledge and, thus, learning. Limiting efforts to attending lecture and attempting homework will not be sufficient. We must invest time to learn, and nothing can replace that.

IV. Homework:
Weekly homework (HW) will be due Fridays at 5pm starting the second week of instruction on January 19th. Homework will be posted on Canvas and is to be submitted electronically as a pdf using Canvas. Please ensure a complete and correct submission *before* the deadline. Corrupt or blank uploads will receive no credit. No exception. A maximum of three late homework sets are accepted no questions asked to accommodate any unusual circumstances including late resubmissions due to corrupt files. Exceptional approval from the undergraduate/graduate office or the Disability Resource Center is required for any additional accommodations. Late homework must be turned in within a week of the due date. If late HW is submitted within 3 days of the due date it will receive full credit if complete. Partial credit will be given afterwards, with a penalty of 10% for each additional day. HW will be graded for completion. Students must show work towards solution for full credit.

V. Working Groups: Working groups will be created by the instructor at the beginning of the quarter. Working groups will not change throughout the quarter unless serious complications arise. You are expected to reach out the members of your working group at the beginning of the quarter and establish weekly meeting times that accommodate the group. If you are utilizing any of the tutoring or section services, this time may also count towards your meeting times if you are all present to collectively ask questions. Alternatively, a representative subset of the group may ask questions on behalf of the group if all members cannot attend. The additional time needed to meet with your group is not meant to create additional work but rather cut down on the time needed for independent study through collective learning. That is, a one-hour meeting with your group may save you three hours of time where you are trying to figure things out on your own. Groups assignments will consider section assignments to facilitate coordination and communication.

VI. Group Projects:
In addition to homework, there will be two group projects completed with the working groups described above. The same late policy described for HW applies here. Student submissions must be individually generated and submitted even if the work was completed collaboratively. I may allow a subset of the project to be submitted as a group (e.g. one submission for the group).

VII. Quizzes:
There will be weekly quizzes to be completed before class on Wednesdays starting Jan 17th. Quizzes will be administered and submitted through canvas. The three lowest quiz scores will be dropped at the end of the quarter to accommodate unexpected circumstances that result in missed quizzes or low scores. There will be no further accommodations. The quiz will be timed and should be completed independently. We will go over problems in class. There will be NO makeup quizzes. During the quiz period, there is absolutely no discussion permitted including postings on discussion forums. Please get in all your questions on course material before the quiz opens. Quizzes are meant to encourage review of lecture material. The quizzes will include only material covered in previous lectures.

VIII. Grading Procedures:

(a) **homework** (20%)
(b) **weekly quizzes** (25%)
(c) **2 projects** (20%: 10% each)
(d) **discussion section attendance & participation** (5%)
(e) **midterm exam** (10%)
(f) **final exam** (20%)
(g) **miscellaneous surveys** (extra credit)

Grading will be on a standard scale.
A+ [100, 97]; A (97, 94]; A- (94,90]; B+ (90,87]; B (87, 84]; B- (84,80]; C+ (80,77]; C (77, 74];
C- (74,70];

IX. Teaching Team:

Our teaching team consists of the primary instructor, teaching assistants (TA) and tutors from learning services. We are here to help. We suggest that you try to identify material you did not grasp on a weekly basis and seek one of us for explanations and clarifications. Emails are provided below. Please use emails if you need to setup times to meet outside of listed office hours or section. For general questions that you wish to pose in an email, please use the discussion forum instead so that the class can benefit. If you have a question, it's very likely others have the same question. Scheduled office hours will be listed on the Canvas homepage.

1. **Teaching Assistants (TAs):**
   a. Dante Buhl (dbuhl@ucsc.edu)
   b. Arstanbek Tulekeyev (atulekey@ucsc.edu)
   c. Alyn Musselman (amussel1@ucsc.edu)
2. **Group Tutor:** TBD
3. **LSS Large Group Tutors:**
   a. Tori Lubahn (vlubahn@ucsc.edu)
   b. Osiel Jimenez Flores (ojimene4@ucsc.edu)

X. Communication:
1. **Canvas:** All course information will be on the Canvas course page. Assignments will be created and submitted through Canvas and/or Gradescope only.

XI. Work Ethics

Cheating doesn't hurt me. It hurts you and it hurts your peers. No one student should take unfair advantage over another student. All students will be treated equally in the classroom. That being said if your personal situation is creating barriers that are out of the ordinary, placing you on unequal footing with your peers, please communicate this as soon as possible. Often students come to me (or don't come to me and I reach out) too late for me to consider ANY accommodations to their situation.

Academic Integrity Academic integrity is the cornerstone of a university education. Academic dishonesty diminishes the university as an institution and all members of the university community. It tarnishes the value of a UCSC degree. All members of the UCSC community have an explicit responsibility to foster an environment of trust, honesty, fairness, respect, and responsibility. All members of the university community are expected to present as their original work only that which is truly their own. Plagiarism of any kind is unacceptable. All members of the community are expected to report observed instances of cheating, plagiarism, and other forms of academic dishonesty in order to ensure that the integrity of scholarship is valued and

preserved at UCSC. Any student found in violation of the UCSC Academic Integrity policy may face both academic sanctions imposed by the instructor of record and disciplinary sanctions imposed by the graduate division. Violations of the Academic Integrity policy can result in dismissal from the university and a permanent notation on a student's transcript. For the full policy and disciplinary procedures on academic dishonesty, students and instructors should refer to the Academic Integrity page at the Division of Undergraduate Education or Graduate Division.

XII. Support

● **Support for students with disabilities** UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, preferably within the first two weeks of the quarter. At this time, I would also like us to discuss ways we can ensure your full participation in the course. I encourage all students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu.

● **Support for students with other difficulties** While we sincerely hope that you will be able to pursue your studies peacefully and worry-free, we are aware that in some cases difficulties happen that are beyond your control. You should always feel free and comfortable to bring up any problem with the instructor, but if this is not sufficient, or if you prefer professional help, here are several campus resources that you may want to consider contacting:

  o UC Care which is a confidential space to discuss issues of dating violence, sexual assault and stalking.
  o Slug Support where you can ask for help on many practical issues, including dealing with a financial crisis, problems with your living situation, computers, books, etc.
  o CAPS, which provides counseling and psychological services to students

● **Title IX reporting disclosure** : Title IX prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. If you have experienced sexual harassment or sexual violence, you can receive confidential support and advocacy at the Campus Advocacy Resources and Education (CARE) Office by calling (831) 502-2273. In addition, Counseling and Psychological Services (CAPS) can provide confidential, counseling support, (831) 459-2628. You can also report gender discrimination directly to the University's Title IX Office, (831) 459-2462. Reports to law enforcement can be made to UCPD, (831) 459-2231 ext. 1. For emergencies call 911. Faculty and Teaching Assistants are required under the UC Policy on Sexual Violence and Sexual Harassment to inform the Title IX Office should they become aware that you or any other student has experienced sexual violence or sexual harassment. If you prefer to speak to someone confidentially, please contact UC Care (see above).

XIII. Inclusivity Statement.

We understand that our members represent a rich variety of backgrounds and perspectives. UCSC is committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

  • share their unique experiences, values and beliefs

- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value each other's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in this course and across the university community

XIV. Tentative Course Schedule: (*subject to change*)

Week #	Book Sections	Topics	Assignment
Week 1 Jan. 8-12	5.1,5.2	• Approximating and Computing areas under the curve (graphical interpretation of integrals for functions of one variable) (5.1) • The definite integral (5.2)	
Week 2 Jan 15-19 Monday NO CLASS (**MLK Day**)	5.3, 5.4, 5.6	• The Fundamental Theorem of Calculus, Part I-II (5.3,5.4) • The substitution method (5.6)	Quiz #1, HW #1 due
Week 3 Jan 22-26	6.1-6.3	• Area between two curves (6.1) • Setting up integrals: volume, density, average value (6.2) • Volumes of revolution (6.3)	Quiz #2, HW #2 due
Week 4 Jan 29-Feb 2	6.4, 6.5, 7.1	• The method of cylindrical shells (6.4) • Cavalier's Method (not in book) • Work and Energy (6.5) • Numerical integration (7.1)	Quiz #3, HW #3 due
Week 5 Feb 5-9	7.2, 7.3	• Integration by parts (7.2) • Trigonometric integrals (7.3)	Quiz #4, HW #4 due **Project 1 due (Mon)**
Week 6 Feb 12-16	7.5, 7.6	• Integrals of hyperbolic and inverse hyperbolic functions (7.5) • Method of partial fractions (7.6)	Quiz #5, HW #5 due
Week 7 Feb 19-23 Monday NO CLASS (**President's Day**)	8.1, 8.4	• Arc length and surface area (8.1) • Taylor polynomials (8.4)	Quiz #6, HW #6 due Midterm (tentative date)

Week 8 Feb 26- Mar 1	10.1-10.3	• Sequences (10.1) • Summing an infinite series (10.2) • Convergence of series with positive terms (10.3)	Quiz #7, HW #7 due
Week 9 March 4-8	10.4, 10.5	• Absolute and conditional convergence (10.4) • The ratio and root tests (10.5)	Quiz #8, HW #8 due
Week 10 March 11-15	10.6, 10.7	• Power series (10.6) • Taylor Series (10.7)	Quiz #9, HW #9 due **Project 2 due (Friday)**
Week 11 **Final Exam** **Thursday** **March 21ˢᵗ** **4-7pm**			

Supplemental Resources

There is tutoring available for this class, provided by [Learning Support Services (LSS)]!

Learning Support Services Tutors are an important part of the teaching team and are here to help you be successful. [Tutoring] is for everyone and open to all students in class to get extra practice on the things you already know or the things you want to know better.

Your tutor(s) is an undergraduate student who took the class, did well, and received extensive training on how to help you learn! Sessions are one-hour long, available several days a week and attendance is voluntary.

Why attend? Easy, students who attend sessions weekly tend to earn a higher final grade than students who do not participate.

Ask your tutor for more information about session times, visit the LSS [website], or visit [in person at the ARCenter]. You can also view your Tutor's schedule and sign up on [Tutor Hub.]

[Learning Support Services], catch-up, keep-up, excel!