

MAT 1412-331

Calculus I

Fall 2024 | CRN: 90755 | Four Credits

Last Updated: September 10, 2024
Instructor: D. Tony Sun
Meeting Times: Tues./Thurs. 3–4:15 P.M.
Location: Glueck Center G307

Syllabus



Yeshiva University

Course Description

In this course, we look into some fundamental topics revolving around mathematical functions: limits, continuity, derivatives, relevant applications to graphing, maxima and minima in optimization problems, related rates, the Mean Value Theorem, integration, the Fundamental Theorem of Calculus, and integration by substitution. Note that these are under the context of single-variable, real-valued functions.

In addition, in accordance with the “Lecture & Lab” type, along-side with theoretical derivations and computational, forward-reasoning exercises, the instructor also tries to design and introduce a few (e.g., every two to three weeks) computer programming assignments, with the first lab or two in Python followed by another lab in PASCAL or C.

Instructor, Class, and Recitation Information

The instructor Mr. Sun has e-mail address dachao.sun@yu.edu and his mobile phone number 267.881.3798. There will also be **weekly office hours** currently planned at **Wednesdays 10:30 A.M.–2:00 P.M. on the second floor of Mendel Gottesman Library at the couches to the right, by glass window toward Amsterdam Avenue**. If there are further adjustments, I will try to inform and make a note on Canvas and in class (last adjusted on Tuesday Sep. 10).

Lecture meetings for class are twice a week at **3-4:15 P.M. on Tuesday and Thursdays**; the recitations are weekly at **6:45–7:35 P.M. on Tuesdays**. Both classes and recitations are at the same classroom Glueck Center G307, Wilf Campus. Essential information will be available and up to date on the associated Canvas (yu.instructure.com) course page.

Prerequisite(s) and Corequisite(s)

The skillset needed prior to starting this course is a collection of common math skills by the completion of high school, normally speaking basic quantitative skills, plane Euclidean geometry such as the ability to read and leverage the Cartesian coordinate system; but generally it is the instructor’s expectation that the student would be good reasoners, have analytical and algebraic awareness, are able to make organized mathematical arguments, and overall a basic mathematical maturity and a good work-ethic. Meanwhile, the “Program Information” section for mathematics courses at Yeshiva (www.yu.edu/ug/mathematics) has a good summary, which can be equated similar to the following:

1. (the student) had gone through roughly speaking three (3) years of high school mathematics;
2. then, since college, had taken MATH 1160 Precalculus;
3. if without the item above, had taken and passed the “Online Math Placement Test” with a minimum score of twenty (20) out of thirty (30). For example, if not passing this minimum score, the student needs to register for MATH 1160 instead;
4. otherwise, an exempt from Online Math Placement Test requires: (i) had earned a score of four (4) or five (5) on AP Calculus AB or BC; (ii) have taken any calculus sequence course(s) at the collegiate level, and have earned a grade of C or above.

With the above description for prerequisites said, an other collegiate course MAT 1160 (Precalculus) is being offered recently and consistently that should provide a comprehensive preparation for MAT 1412. These two courses though might possibly be taken concurrently; still, to begin this course MAT 1412, the instructor plans to allocate one to two lessons to talk about **preliminaries with an associated initial homework set** prior to entry to Chapter Two on limits and derivatives in Stewart's book.

Textbooks

The former edition of Professor James Stewart's book

Stewart, J. (2008). *Calculus: Early Transcendentals*, 6e. Cengage Learning.

is our primary text which may be available now for less than ten dollars (\$10.00) each used copy, upon which the development of topics are based; a secondary reference text by Tom M. Apostol (1967) is recommended and might be referred to during class, along-side with other reference materials to be included in the later Bibliography section; these other sources also played an important role in the instructor's preparation.

Course Outline with Learning Objectives

Overseeing topics of content, we generally have the following components:

Preliminaries: essentials of mathematical functions; mathematical sets (optional); fundamentals of mathematical logic (optional); basic proof techniques (optional); review of trigonometry and transcendental functions.

Limits and Continuity: tangent and velocity; definition(s) of a limit of a function; limit laws; limits of sequences; the Axiom of Continuity; continuous functions; Epsilon-Delta (ϵ - δ) versus "intrinsic" definitions of continuity; limits at infinity and horizontal asymptotes.

Differentiation: rates of change and derivatives; derivatives as functions; differentiation rules; derivatives of polynomials, exponential, trigonometric, logarithmic, and hyperbolic functions; the Product and Quotient rules; the Chain Rule; implicit differentiation; the Mean Value Theorem.

Integration: antiderivatives; areas and distances; definite integrals; the Fundamental Theorem of Calculus; indefinite integrals and the Net Change Theorem; integration by substitution (a.k.a. U-substitution).

Immediate Applications: early methods for **finding tangents**; **rates of change** in natural and social sciences; exponential growth and decay; related rates; **linear approximation and differentials**; **Taylor polynomials**; basics of optimization; **intermediate forms and l'Hôpital's Rule**; **more graphing and curve sketching**; Newton's method; **areas between curves**; volumes and work; **average value of a function**; and **applications in finance and economics**. *[adjustments needed if necessary]*

which (the above collection of objectives) are what the instructor expects for this course, with a priority to maximize learning outcomes by (i) the standard, well-known Calculus One curriculum at Yeshiva University and other institutions with a close context, and (ii) the baseline of common final exams of this topic taught in the U.S. at the collegiate level, and (iii) students' actual comprehension of these topics and skills as well as mathematical communication skills demonstrated in assignments handed-in. The pace is approximately 2-3 weeks per component such that a tentative outline would look like a weekly schedule by meeting times (including the recitation on Tuesday and the office hour on Wednesday) but also organized by content; because of this, a quiz is expected by the end of each component for which there will be at least five quizzes.

Types of Assignments, Rubrics for Grading, and Study Suggestions

The instructor plans to provide approximately seven (7) up to fourteen (14) **homework problem sets** across **seventeen weeks of duration of Fall 2024 semester**; this should be subject to change according to content (e.g., the first homework on functions, logic, and set theory, and a later one on differentiation rules) and the Academic Calendar in general. These homework sets are expected to be collected by due dates to be commented by the instructor for the written content and be marked by their completions, i.e., not graded numerically. Homework contributes to 15% of total grade. Meanwhile, participation in regular classes (i.e., by means of traditional lectures) and weekly recitations, the latter being optional, contributes to 10% of grade.

Quizzes, the mid-term and final examinations will contribute to 20%, 15% and 40% respectively. The quizzes along the way are to be scheduled based on content topics, about every other week.

For homework, which is by completion and for practicing actual skills in working with functions, it should be an important medium for the instructor to know more about the student's thought processes and mathematical writing styles. Whether or not a homework assignment is handed in yet, students are highly recommended to come by weekly office hours (along-side with recitations) on Wednesdays to talk about written solutions with the instructor. When it comes to quizzes and exams, the grading will be more formal based on **quality**, **correctness**, and **cohesiveness of mathematical arguments**, etc.

Finally, the remaining 10% portion corresponds to experimental, computer programming assignments; these experiments or "labs" are partially guided tutorials for practice, and partially extended, exploratory questions as exercises. During recitations, the instructor plans to go over the majority of homework problems, and spend sufficient amount of time introducing these programming assignments and their extended exercises. If interested, a (brief) final project by the students' own choice of topic can serve as extra credit assignment and possibly for in-class presentations.

Component	Percentage of Grades
Participation (Classes, Recitations, and Programming Assignments)	10%
Homework Problem Sets	15%
Quizzes	20%
Midterm Examination	15%
Final Examination	40%

Make up tests and assignments are possible when needed, for instance with a note from physician, where grades would be adjusted accordingly. There is no curving. MAT 1412 is not a competition; but as an example, if the overall weighted score is in the low eighties (80s) it could be a B+, 70–80 a B or B-, and so on.

At the same time, the instructor assumes the necessity of attendance, along with recitations, which are in fact all highly recommended. Homework will be collected and commented for the student as a reference of learning and mathematical communication.

To prepare, the instructor expects to post, prior to start of each class, any **required and optional readings** from both the textbook and external materials, and please allocate some enough time to read these passages, and further try problems and short proofs if possible. In addition, as sometimes suggested by the educational circle, sketching "concept maps" may be helpful as a pre-exam activity, or as a "post-exam reflection."

University Policies: Academic Integrity, Accommodations, Student Support, etc.

Equity Compliance and Title IX Yeshiva University has a long-standing commitment to equal opportunity and affirmative action. We apply every good faith effort in achieving nondiscrimination and equality of opportunity in employment and in all spheres of academic life. All University-wide decisions with regard to faculty, staff and students are based on equitable and equally applied standards of excellence. Non-Discrimination & Anti-Harassment procedures have been established, both as a legal obligation under applicable law and

as a visible and formal expression of institutional policy. — according to “Notice of Non-Discrimination & Anti-Harassment” retrieved from <https://www.yu.edu/hr/Equity-Compliance-TitleIX>

Academic Integrity The submission by a student of any examination, course assignment, or requirement is assumed to guarantee that the thoughts and expressions therein not expressly credited to another are the student’s own. Evidence to the contrary will result in appropriate penalties as outlined at

<https://www.yu.edu/academic-integrity>

and, in the end, it is the student’s responsibility to be aware of behaviors that constitute academic dishonesty.

Normally, the syllabus (rubrics, topics to cover, etc.) will remain intact throughout the course, although in theory the instructor reserves the right to make any changes he considers academically advisable, only when necessary, and such changes will be announced and in some degree discussed with students in class and during office hours.

Artificial Intelligence Use Policy (None Allowed): This course follows Yeshiva University’s Academic Integrity Policy (<https://www.yu.edu/academic-integrity>) on artificial intelligence. The use of generative artificial intelligence or any platform with generative artificial intelligence capabilities is prohibited in this course. The use of assistive artificial intelligence is prohibited in this course. Examples of such prohibited assistive AI include but are not limited to Hemmingway, Quillbot, etc. If you are unsure if a platform is allowed, please inquire directly with the instructor. Please see the webpage <https://www.yu.edu/academic-integrity> for further information.

Special Accommodations Students with disabilities who are enrolled in this course and who will be requesting documented disability-related accommodations should make an appointment with the Office of Disability Services (akelsen@yu.edu) during the first week of class. The office is located in Furst Hall, Suite 412. Once you have been approved for accommodations, please submit your accommodation letter and discuss any specifics with me to ensure the successful implementation of your accommodations.

Writing Center Free Help with Your Writing! The Wilf Campus Writing Center offers individualized tutoring that can support your projects for this course. All writers need feedback, even strong ones. Find out more and make an appointment at

<https://yu.mywconline.net>

Learning Success Center Any undergraduate Sy Syms or Yeshiva College student interested in improving his study skills and academic performance is welcome and encouraged to visit the Learning Success Center office for academic support. A learning specialist helps you develop the reading, writing and study skills necessary for academic success. For more information, or to schedule an appointment, please email

learningsuccesscenter@yu.edu

Libraries Needing help with your research—the Yeshiva University Libraries (<https://library.yu.edu/home>) offer individualized consultations that will help you locate and cite journal articles, books, and other credible sources for solid papers, presentations, and reports. Stop into the libraries or make an appointment (<https://yu.libcal.com/appointments>) with a librarian. You can also email the library using this Library ASK Form available at <https://yu.libwizard.com/f/ask> any time or contact via Live Chat (https://library.yu.edu/ask_the_library) as librarians are always happy to help you.

Generally, according to the Human Resources at Yeshiva University, employment policies are posted at <https://www.yu.edu/hr/policies> Also, there are certain specific policies which the faculty and staff shall be familiar with as follows:

- Nondiscrimination and Anti-Harassment Policy (https://www.yu.edu/sites/default/files/inline-files/Non-Discrimination%20and%20Anti-Harassment%20Policy%20-%20TIX%20Policy%20%28August%202022%29%20%2800061646xA0726%29_3.pdf)

- Code of Conduct: Code of Conduct (https://www.yu.edu/sites/default/files/legacy/uploadedFiles/Offices_and_Services/HR/Working_at_YU/YU-CodeOfConduct.pdf)
- Drug and Alcohol Policy (https://www.yu.edu/sites/default/files/legacy/uploadedFiles/Offices_and_Services/HR/Working_at_YU/policies/DrugPolicy9232014.pdf)
- Reasonable Accommodation Policy (<https://www.yu.edu/hr/disability>)
- Romantic Relationships Policy (https://www.yu.edu/sites/default/files/inline-files/Romantic%20Relationships%20Policy%20%2800051879xA0726%29_0.pdf)
- Whistleblower Policy and Hotline
(https://www.yu.edu/sites/default/files/inline-files/Whistleblower%20Policy%20March%202022_0.pdf)
- Information Technology Resources and Security Information (<https://www.yu.edu/sites/default/files/inline-files/ITS%20handbook%20-%20Admin%20Faculty%20and%20Staff.pdf>)
- Records Retention Policy (https://www.yu.edu/sites/default/files/inline-files/Records%20Retention%20Policy%20%2800037922xA0726%29_2.pdf)

Auxiliary Bibliography

This bibliography list, which is not comprehensive with respect to any materials cited or mentioned throughout this semester, can still be beneficial for students' self-study to (i) either lay groundwork, prior to entering the Calculus sequence, or (ii) refreshing memory and different perspectives of the topics in our class.

(Related Courses)

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- Hendricks, K. (Fall 2019). Math 135, Sections 61-63: Calculus I (course webpage). Available at <http://sites.math.rutgers.edu/~kh754/Math135.html>
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- McDougal, S. (Spring 2019). Mathematics 3A: Calculus I (course syllabus). Available at <https://www.berkeleycitycollege.edu/smcDougal/files/2019/01/Syllabus-3A-S19.pdf>
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- Connally, E. et al. (2011). *Functions Modeling Change: A Preparation for Calculus* (Fourth Edition). John Wiley & Sons, Inc. ISBN-13: 978-0-470-48474-6
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- Lang, S. (1964). *A First Course in Calculus*. Addison-Wesley Publishing Company, Inc.
- Larson, R. E., Hostetler, R. P. & Edwards, B. H. (1990). *Calculus with Analytic Geometry* (Fourth Edition). D. C. Heath and Company. ISBN: 0-669-16406-2
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