

MATH 10a: Techniques of Calculus (a)
Summer 2020

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Calculus:

Calculus is one of the greatest intellectual achievements of humankind. The beautiful idea at the heart of this subject allows us to explore both the infinite and the infinitesimal. This gives us the tools to model and then analyze phenomena that change, which means practically everything!

Text:

Single Variable Calculus: Concepts and Contexts, James Stewart, 4th edition.

Prerequisite:

A solid knowledge of precalculus. This prerequisite can be satisfied by taking Math 5a at Brandeis or by achieving a satisfactory score on the online math placement exam (see <http://www.brandeis.edu/registrar/newstudent/testing.html#mathtest>).

IMPORTANT! We want you to succeed and experience shows that most students who struggle with Math 10a do so because they lack a solid knowledge of precalculus. For example, you will have to work with expressions like:

- $\ln(3^{\sin t})$
- $\ln\left(\frac{1}{\sqrt[3]{e}}\right)$
- $e^{2x} - 5e^x + 6$
- $\sec\left(\frac{\ln(x+2)}{x+2}\right)$
- $a^{-2\log_a(2)}$
- $\ln(x^2 - 1) - \ln(x + 1)$

If you are unsure whether Math 10a is the right course for you, please contact the course coordinator, Becci Torrey (rtorrey@brandeis.edu).

Learning Goals for Math 10a:

- Identify and apply key ideas and concepts, including:
 - The concept of limits, and how to compute a variety of limits.
 - The definition of the derivative; its interpretation in terms of slopes and instantaneous rates of change; and its ubiquitous appearance in other contexts and courses.
 - Compute the derivatives of a variety of functions.
 - Use derivatives to find extrema of functions, and solve optimization problems arising in numerous contexts.
 - Use information gained from algebraic information to draw qualitatively accurate graphs of functions. Synthesize a large number of pieces of information into a cohesive whole.
 - The idea of the definite integral and how it is used to solve area and distance problems.

Learning Goals for Math 10a: (cont.)

- Hone quantitative reasoning skills by solving problems that present familiar material in new ways.
- Practice breaking down a complicated problem into simpler pieces, solving those pieces, and reassembling them. This skill will help you in all your science courses.
- Gain confidence by employing a large number of techniques to solve commonly occurring types of problems.

Syllabus:

We will cover the following topics this semester:

Section	Topic
2.1	The Tangent and Velocity Problems
2.2	The Limit of a Function
2.3	Calculating Limits Using the Limit Laws
2.4	Continuity
2.5	Limits Involving Infinity
2.6	Derivatives and Rates of Change
2.7	The Derivative as a Function
2.8	What does f' say about f ?
3.1	Derivatives of Polynomials and Exponential Functions
3.2	The Product and Quotient Rules
3.3	Derivatives of Trigonometric Functions
3.4	The Chain Rule
3.5	Implicit Differentiation
3.7	Derivatives of Logarithmic Functions
3.8	Rates of Change in the Natural and Social Sciences
4.1	Related Rates
4.2	Maximum and Minimum Values
4.3	Derivatives and Shapes of Curves
4.4	Graphing with Calculus
4.5	Indeterminate Forms and L'Hôpital's Rule
4.6	Optimization Problems
4.8	Antiderivatives
App F	Sigma Notation
5.1	Areas and Distances
5.2	The Definite Integral
5.3	The Fundamental Theorem of Calculus (Evaluating Definite Integrals)

Note: Some topics may be added or omitted as time permits.

OVER →

Exams:

There will be no exams. In place of exams you will complete a long-term group project (the group can be just you if you prefer!) to be submitted in the final week of the course.

Grades:

- Your grade in the course will be based on the following:
 - **Homework**
 - * Homework assignments will be collected once per week.
 - * **No late homeworks will be accepted.**
 - * We encourage you to discuss homework problems with your classmates, but you must write up your own solutions. You may not use any solution manuals.
 - **Quizzes**
 - * Daily reading quizzes will be given.
 - * **No make-up quizzes will be given.** Missed quizzes count as zeroes. However, the lowest 25% of your quiz grades will be dropped.
 - **Final project**
- Your grade for the course will be computed by taking the maximum of the following two numbers:
 - Homework (50%), quizzes (20%), final project (30%)
 - Homework (30%), quizzes (20%), final project (50%)

Calculators:

You should have access to a scientific calculator for homework (you can use a free online one), but you do not need a graphing calculator.

LATTE:

All course materials for Math 10a will be available online on LATTE. Log in at <http://latte.brandeis.edu> using your Unet username and password.

Self-quizzes:

There is a link called “Self-quizzes” on your Math 10a LATTE course page. The Math 10a self-quizzes cover all the material being studied in Math 10a. Complete solutions to each self-quiz are given. These self-quizzes are optional and for your use only, and have no effect on your grade.

Office hours:

You are encouraged to attend office hours whenever you have questions about the course material. If you can't attend office hours, don't hesitate to ask for an appointment for another time.

Four-Credit Course (with three hours of class-time per week):

Success in this 4 credit hour course is based on the expectation that students will spend a **minimum of 9 hours of study time per week** in preparation for class (readings, papers, discussion sections, preparation for exams, etc.). We're operating on 8 hours of class-time per week so scale this up to 24 hours of study time per week.

OVER →

Accommodations:

Brandeis seeks to welcome and include all students. If you are a student who needs accommodations as outlined in an accommodations letter, please talk with me and present your letter of accommodation as soon as you can. I want to support you.

In order to provide test accommodations, I need the letter more than 48 hours in advance. I want to provide your accommodations, but cannot do so retroactively. If you have questions about documenting a disability or requesting accommodations, please contact Student Accessibility Support (SAS) at 781.736.3470 or access@brandeis.edu

Academic Integrity:

You are expected to follow the University's policy on academic integrity, which is distributed annually as section 4 of the Rights and Responsibilities Handbook (see <http://www.brandeis.edu/studentaffairs/srcs/rr/index.html>). Instances of alleged dishonesty will be forwarded to the Department of Student Development and Conduct for possible referral to the Student Judicial System. Potential sanctions include failure in the course and suspension from the University. If you have any questions about how these policies apply to your conduct in this course, please ask.

Name/Pronouns:

If you have a preferred name and/or preferred pronouns you would like me to use, please let me know either by email or in person. Thanks!