

MATH 10a: Techniques of Calculus (a)
Summer 2018

Instructor: Aritro Pathak

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Office hours: Monday 12:30 PM-1:30PM, Thursday: 11:00 AM-12:00 PM

Class Schedule: Monday, Tuesday, Wednesday, Thursday: 9:00 AM-10:50 PM, Goldsmith 317

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.

IMPORTANT! Most students who struggle in Math 10a do so because they lack a solid knowledge of precalculus.

For example, on an exam you will have to work with expressions like:

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

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:

- Understand and be able to apply key ideas of calculus, including:
 - Develop a basic understanding of limits and learn to compute a variety of limits.
 - Understand the definition of the derivative, and its interpretation in terms of slope and instantaneous rate of change.
 - Compute derivatives of polynomial, rational, exponential, logarithmic and trigonometric functions, as well as combinations of these functions.
 - Use derivatives to find and sketch all the important features of graphs of functions (even quite complicated functions).
 - Use derivatives to analyze the behavior of functions, e.g., finding the extrema of functions and determining the end behavior of functions.
 - Use derivatives to solve a variety of optimization problems and applied rate of change problems.
 - Compute antiderivatives of polynomial, rational, exponential, logarithmic and trigonometric functions.
 - Understand basic ideas of differential equations.

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Learning Goals for Math 10a: (cont.)

- Hone quantitative reasoning skills by solving problems that challenge you to understand the material on a deeper level by presenting the material in ways not demonstrated explicitly in class.
- Improve communication skills, particularly for communicating technical information, by practicing writing (on homework, quizzes and exams) and speaking (to classmates, evening help tutors and your instructor) with precision about these mathematical concepts.
- Develop a sense for how the specific skills learned in math 10a will transfer to other disciplines by solving applied problems from other fields, such as biology, chemistry, physics and economics.

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 (including related rates) |
| 3.7 | Derivatives of Logarithmic Functions |
| 3.8 | Rates of Change in the Natural and Social Sciences |
| 4.2 | Maximum and Minimum Values |
| 4.3 | Derivatives and Shapes of Curves |
| 4.4 | Graphing with Calculus and Calculators (no calculators used) |
| 4.5 | Indeterminate Forms and L'Hôpital's Rule |
| 4.6 | Optimization Problems |
| 4.8 | Antiderivatives |
| | Differential Equations |

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

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Exams:

There will be one midterm exam and a final exam. **TENTATIVE exam dates:**

- Midterm Exam : TBA
- Final Exam: In class, July 5; 9:00AM-12:00PM.

Midterm exams will be held in the evening. If you have an academic conflict (such as a class, lab, or another exam) with a midterm exam, inform your instructor **at least one week before the exam**. If the conflict can't be resolved, we will offer you a make-up exam.

Grades:

Your grade in the course will be based on the following:

- **Homework (15% of your grade).**
 - Homework assignments will be collected once or twice a week.
 - **No late homeworks will be accepted**, but your three lowest homework grades will be dropped.
 - 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 (15% of your grade).**
 - Four short 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.*
- **Midterm exam (25% of your grade).**
- **Final exam (45% of your grade).**

Calculators:

Calculators are **not** allowed during exams or quizzes. You should have access to a scientific calculator for homework, 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.

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Office hours:

You are encouraged to attend your instructor's 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.

Students with disabilities:

If you are a student who needs academic accommodations because of a documented disability you should present your letter of accommodation to your instructor as soon as possible. If you have questions about documenting a disability or requesting academic accommodations you should contact Beth Rodgers-Kay in the Office of Academic Services at x63470 or at brodgers@brandeis.edu. Letters of accommodations should be presented at the start of the semester to ensure provision of accommodations. Accommodations cannot be granted retroactively.

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!