Text:


Prerequisites:

Math 10a or a satisfactory score on the math department’s calculus placement exam. For the exam, see [http://www.brandeis.edu/registrar/newstudent/testing.html](http://www.brandeis.edu/registrar/newstudent/testing.html).

Learning Goals for Math 10b:

By the end of the semester, you will:

- Understand and be able to apply key ideas of calculus, including:
  - the interpretation of the definite integral in terms of area and net change;
  - the relationship between differential and integral calculus (The Fundamental Theorem of Calculus);
  - using estimation and limits to derive precise calculations;
  - using integration to compute volume and arc length;
  - using integration and Taylor series techniques to solve (or estimate solutions for) differential equations and find antiderivatives.

- Develop proficiency in core techniques for:
  - integration (including substitution, integration by parts and partial fractions);
  - computing improper integrals and testing for convergence of improper integrals; and
  - analyzing infinite series, including tests for convergence.

- 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.

- Develop a sense for how the specific skills learned in math 10b will transfer to other disciplines by solving applied problems from other fields, such as biology, chemistry, physics and economics.

- 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.
## Syllabus:

We will cover the following topics this semester:

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6</td>
<td>Inverse Trig Functions and their Derivatives</td>
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<tr>
<td>App F</td>
<td>Sigma Notation</td>
</tr>
<tr>
<td>5.1</td>
<td>Areas and Distances</td>
</tr>
<tr>
<td>5.2</td>
<td>The Definite Integral</td>
</tr>
<tr>
<td>5.4</td>
<td>The Fundamental Theorem of Calculus (FTC I)</td>
</tr>
<tr>
<td>5.3</td>
<td>The Fundamental Theorem of Calculus (FTC II)</td>
</tr>
<tr>
<td>5.5</td>
<td>Integration by Substitution</td>
</tr>
<tr>
<td>5.6</td>
<td>Integration by Parts</td>
</tr>
<tr>
<td>5.7</td>
<td>Additional Techniques of Integration (Partial Fractions)</td>
</tr>
<tr>
<td>5.9</td>
<td>Approximate Integration (Midpoint and Trapezoidal Rules)</td>
</tr>
<tr>
<td>5.10</td>
<td>Improper Integrals</td>
</tr>
<tr>
<td>6.1</td>
<td>More about Areas</td>
</tr>
<tr>
<td>6.2</td>
<td>Volumes (Disks and Washers)</td>
</tr>
<tr>
<td>6.4</td>
<td>Arc Length</td>
</tr>
<tr>
<td>6.7</td>
<td>Applications to Economics and Biology</td>
</tr>
<tr>
<td>7.1</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>7.3</td>
<td>Separable Equations</td>
</tr>
<tr>
<td>8.1</td>
<td>Sequences</td>
</tr>
<tr>
<td>8.2</td>
<td>Introduction to Series</td>
</tr>
<tr>
<td>8.3</td>
<td>The Integral Test</td>
</tr>
<tr>
<td>8.4</td>
<td>Other Convergence Tests (Alternating Series Test and Ratio Test)</td>
</tr>
<tr>
<td>8.5</td>
<td>Power Series</td>
</tr>
<tr>
<td>8.6</td>
<td>Representations of Functions as Power Series</td>
</tr>
<tr>
<td>8.7</td>
<td>Taylor Series</td>
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</tbody>
</table>

**Note:** Some topics may be added, omitted, or presented in a different order, as time permits.

## LATTE:

All course materials for Math 10b will be available online on LATTE. Log in at [http://latte.brandeis.edu](http://latte.brandeis.edu) using your Unet username and password.

## 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.

## 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.).
Exams:
There will be two midterm exams and a final exam. **TENTATIVE exam dates:**

- Exam 1: Tuesday, February 26, 7 – 9 p.m.
- Exam 2: Tuesday, March 26, 7 – 9 p.m.
- Final Exam: TBD by registrar

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.

**Flipped Class Structure:** The original idea behind “flipped” classes is that the traditional lecture format for teaching academic material is surprisingly ineffective. There is fairly good evidence, coming from studies conducted at the university and high school level, that passively listening to explanations in a lecture leads to less understanding than actively trying to solve problems and answer questions. The evidence suggests that most of the actual learning happens not in lecture, but when students sit down with their notes and their problem sets and try to do their exercises. **Flipped classes take advantage of this by having students read about and take notes on material before class, and then discuss problems in class where the instructor can more easily identify and address questions or misunderstandings.**

With this goal in mind, we are adding some regular structure to keep things organized. We will work almost entirely from the textbook and move through it section by section spending one or two class days per section. There will be three homework assignments for each section: an A assignment, a B assignment, and a C assignment.

- For the A assignment you will be asked to read the section of the textbook and take notes. You will be given a reading guide consisting of some reading comprehension questions and instructions which will guide you through making a ‘cheat sheet’ with all the important information from that unit. By the end of the semester you will have a folder filled with these cheat sheets which will be your own mini calculus text which you can then use for the rest of your time at university.

- For the B assignment you will be given 5-10 practice problems of easy to medium difficulty. Using the information you recorded on your cheat sheet from the A assignment, you will be expected to write up partial or complete solutions to all of these problems. They will be graded for ‘good faith effort’ (did you try them or not?) and not for perfect solutions; the point of these problems is to help you formulate questions and turn the information from the reading into a practical understanding, NOT to write down the answer. Our in-class discussions will be centered around these problems. During each class, up to five people will be selected randomly to present their partial or complete solutions to the class as a starting point for the discussion.

- In the C assignment you will be given 2-3 harder problems to assess your understanding. These should be solved carefully and written up neatly. They will constitute the majority of your grade for the unit.
In class we will focus primarily on the B problems. The class will be divided into groups and every day I will assign each person in your group one of the B problems to present to the rest of the class. You do not have to present a perfect solution, but you do have to be able to clearly describe the attempt you made, and share your opinion on why it did or didn’t work. The point of this is to thoroughly understand the solutions to the B problems and identify any tough questions you have about the material. The TA and I will be engaged with this process to answer questions and help you navigate the topics and learn the problem solving methods. This is where I hope you’ll gain the most out of the class!

Between each pair of classes you will have all three of types of assignment. You will have the Part C challenge problems from the previous section, the Part B practice problems from the current section, and the Part A notes/reading from the next section. In total this comes out to doing approximately three hard, three medium, and three easy problems plus some reading and note-taking between each pair of classes. Since the expected time commitment for calculus is nine hours of homework each week that comes to three hours per class of preparation beforehand. Here is an example of how a week’s worth of assignments might look, where the assignments listed under a particular day would be due at the beginning of that class.

<table>
<thead>
<tr>
<th>Monday</th>
<th>Wednesday</th>
<th>Thursday</th>
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</thead>
<tbody>
<tr>
<td>...</td>
<td>5.2-C</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>5.3-B</td>
<td>5.3-C</td>
</tr>
<tr>
<td>5.4-A</td>
<td>5.4-B</td>
<td>5.4-C</td>
</tr>
<tr>
<td>5.5-A</td>
<td>5.5-B</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>5.6-A</td>
<td>...</td>
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</tbody>
</table>

For longer or harder sections, we will add an additional Part B assignment to the rotation so the schedule would look like this:

<table>
<thead>
<tr>
<th>Monday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Monday</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>5.2-C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>5.3-B</td>
<td>5.3-C</td>
<td></td>
</tr>
<tr>
<td>(harder section)</td>
<td>5.4-A</td>
<td>5.4-B</td>
<td>5.4-B'</td>
</tr>
<tr>
<td></td>
<td>5.5-A</td>
<td>5.5-B</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>5.6-A</td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

So for Wednesday and Thursday you would only have to prepare two assignments before class. I will post the assignments on Latte in advance so that people who wish to work ahead may do so. I realize Wednesday nights might be tough for people, so I recommend doing the Part A and Part B assignments due on Thursday ahead of time. The Part C’s will be easier to complete after the in-class discussion.

There will be no* quizzes in this class!

*Except for one to check that everyone has read the syllabus!
Grades: Your grade in the course will be based on the following:

- **Part A’s (5% of your grade).**
  - Should be written out neatly, well-spaced, and complete.
  - Will be scanned and uploaded to Latte before class. (You may use your smartphone for this, or we can work out some other arrangement.)
  - Will be graded on a 0-10 scale based on legibility, organization, and completeness.

- **Part B’s (5% of your grade).**
  - Should be written out neatly, well-spaced, and complete.
  - You will receive a Part B grade each time you present a solution to the class.
  - Presentations will be graded on a 0-10 scale. A 10/10 presentation must include the following:
    * Write out the statement of the problem.
    * Write out your complete or partial solution.
    * Comment on the steps of the solution. (*Why did you try your approach?*/*Which steps didn’t work?*)
    * Answer questions from me and your other classmates.
  - If you are absent on a day you are chosen to present you will receive no credit.

- **Part C’s (10% of your grade).**
  - Should be written out neatly, well-spaced, and complete.
  - Will be graded for clear, correct, and complete solutions to the assigned problems.
  - Each problem will be worth between 10 and 15 points (assignment will be out of 30-45 points total).
  - To be turned in at the start of every class.
  - **No late homeworks will be accepted**, but 25% of your lowest C grades will be dropped.

- **Your grade for the course will be computed by taking the maximum of the following two numbers:**
  - Parts A, B, C (20%), both midterms (25% each), final exam (30%)
  - Parts A, B, C (20%), highest midterm (25%), final exam (55%)

Self-quizzes:

There is a link called “Self-quizzes” on your Math 10b LATTE course page. The Math 10b self-quizzes cover all the material being studied in Math 10b. 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 use 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.

Evening help sessions:
You are welcome to attend the Math Department’s evening help sessions whenever you
like. These are drop-in sessions that are available to students in Math 5a, 10a and 10b every
Monday, Tuesday, Wednesday, and Thursday evening anytime between 7:00 pm and 9:00 pm.
Help sessions are held in Goldsmith 101 and will begin on Tuesday, January 22nd.

Students with disabilities:
If you are a student who needs academic accommodations because of a documented disabil-
ity 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 retroac-
tively.

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
send me an email.

Course coordinator:
Professor Becci Torrey, Goldsmith 222, x63054, rtorrey@brandeis.edu.