In a world that is constantly changing, there is no one subject or set of subjects that will serve you for the foreseeable future, let alone for the rest of your life. The most important skill to acquire now is learning how to learn. - John Naisbitt

Course Description:
The main goal of this course is to for you to acquire the tools you need to succeed in your future math and science courses. This includes not only calculation skills and how to apply these calculations to scenarios from science and economics, but also how to read math, how to study for a math exam, how to work together to solve problems, and how to harness your personal strengths for maximum efficiency in learning. The course is also designed to help you gain control over your own learning, which should help you to feel more confident in your math skills.

Learning Goals for Math 5a:
1. Enter Math 10a (and other science, econ, psych, etc. classes) with stronger numeracy/precalculus skills than the average student.
2. Learn how to learn/improve at math.
3. Recognize opportunities to apply skills from this class in your life and in other classes.

Texts:
  - Available free online: https://yoshiwarabooks.org/mfg/MFG.html
  - Available free online: https://tinyurl.com/y7vku8bx

See last page of syllabus for topics covered in each text.

Prerequisite:
There are no prerequisites for Math 5a. Students who are unsure of their placement and are considering Math 10a should take the calculus placement exam or consult with their instructor: http://www.brandeis.edu/registrar/newstudent/testing.html#mathtest.

LATTE:
All course materials for Math 5a will be available online on LATTE. Log in at http://latte.brandeis.edu using your Unet username and password.
Learning Goal #1:

Enter Math 10a (and other science, econ, psych, etc. classes) with stronger numeracy/precalculus skills than the average student.

How will this course help you achieve Learning Goal #1?

• During class, you will work in teams on problems that are designed to deepen your understanding of the material.

• You will have multiple opportunities throughout the semester to present problems to the class (your team will help you prepare). Presenting problems is an incredibly powerful tool to push yourself to understand the material in a profound way.

• Mastery Grading: This style of grading is designed to hold you accountable for learning the content of the course. If you get something wrong, you get to try again until you get it right. (Pretty awesome, huh?) But it also means you can’t just let things go without really learning them. Here’s how it works:

Our course has a list of Content Outcomes – these are mathematical facts and skills that comprise the content we are learning in this class. (Content outcomes include things like “Solve an exponential equation” and “Graph a piecewise function” – see LATTE for a complete list.)

Every Friday you will have an opportunity to demonstrate mastery of the content we have covered so far in the course. Your work will be held to a high standard (essentially a B+/A- level), but graded only on a credit/no-credit basis. If you earn credit for a particular outcome on two separate Fridays, you have mastered that outcome and no longer need to do those problems on subsequent Fridays. If you do not earn credit on a particular outcome, it does not count against you – but this feedback is valuable: it means you should come to office hours to learn how to do the problem correctly, practice that type of problem more, and then try again on the next Friday Assessment.

With this grading structure, you can be confident at every point in the semester that you have strong skills in all the outcomes you mastered, and you will know exactly which skills and ideas need more work.

Learning Goal #2:

Learn how to learn/improve at math.

How will this course help you achieve Learning Goal #2?

• Reading: One of the most important study skills one needs to have to go far in math and science is the ability to read textbooks in these subjects. The best way to learn how to do this is to practice and reflect on your progress.

This class will require you to read and practice good reading habits (like taking notes) by having a Readiness Assessment Test (RAT) for each Module.¹

¹The course is broken into Modules, each essentially corresponding to a chapter in one of our texts.
We provide a Reading Guide for each Module to help structure your reading. You should use this to create a Cheat Sheet for the module – one sheet of paper (8.5 × 11 or A1) with your notes on that reading.

On RAT days, you will take a multiple choice quiz on the reading, using your Cheat Sheet. Each RAT will be taken twice: first individually, then immediately afterwards as a team. The RAT is designed to hold you and your teammates accountable for the reading, and to help clear up any misunderstandings or questions there may be about the reading content. Retaking the assessment as a team will help you to deepen your understanding through discussion of the problems – you will benefit both from learning things that others picked up on that you may have missed, and by explaining what you learned from the reading to your teammates.

- **Oral Communication:** So many people try to learn math on their own, but all the studies show that the best way to learn is by communicating with others. By talking with others, you gain a deeper understanding and are better able to find holes in your knowledge. It’s more efficient and it’s more fun!

  On most class days\(^2\) we will have a brief introductory lecture on the material, and then you will work with your team on problems to present to the class. You will take turns with your teammates presenting problems so that everyone gets multiple chances to present. Everyone in your team will help you to prepare to make sure your presentation is accurate and you understand the problem well enough to explain to others.

- **Reflections:** If the unexamined life is not worth living, then the unexamined class is not worth taking, right? Many of our reflections are designed to help you think about your study skills and habits. They provide structure for you to try out different tactics to learn what works best for you.

**Learning Goal #3:**

Recognize opportunities to apply skills from this class in your life and in other classes.

**How will this course help you achieve Learning Goal #3?**

- Our texts were chosen in part for their focus on putting the math into context.

- We have quite a few Content Outcomes that involve solving word problems, most of which will come from scenarios you might see in other classes. This will give you the opportunity to practice using your math skills in the context of other fields of study.

- We will also practice many of our math skills with notation used in other fields of study, since this can be a big obstacle in transferring skills to other contexts.

- Several of our Reflections are designed to help you achieve this goal, including finding articles in the news that are related to our class or finding instances of our skills being used in other classes.

\(^2\)(not Fridays and not RAT days)
Grades:

Base Letter Grade (A/B/C/D/E):
At the end of the semester, your base letter will be calculated using the following table. To earn the letter grade listed on the left you must meet the minimum shown in ALL columns for that row.

<table>
<thead>
<tr>
<th>Base Letter Grade</th>
<th>Fundamental Outcomes Mastered</th>
<th>General Outcomes Mastered</th>
<th>RATs &amp; Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8 of 8</td>
<td>28 of 30</td>
<td>90%</td>
</tr>
<tr>
<td>B</td>
<td>8 of 8</td>
<td>25 of 30</td>
<td>80%</td>
</tr>
<tr>
<td>C</td>
<td>7 of 8</td>
<td>22 of 30</td>
<td>70%</td>
</tr>
</tbody>
</table>

Again, the numbers shown above are **minimums** and you must meet **ALL** requirements to earn the specified base letter grade.

Failure to meet any 1 of the C standards will result in a D. Failure to meet all 3 of the C standards will result in an E.

Grade Modifier (‘+’/neutral/‘−’):
The Reflections will be used to modify the base letter grade (to a +/−) as follows. Again, the scores shown are the **minimum** requirements for each grade. Here, X is the letter grade determined by the table above.

<table>
<thead>
<tr>
<th>Final Grade</th>
<th>Total Reflections Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>X+</td>
<td>10</td>
</tr>
<tr>
<td>X</td>
<td>6</td>
</tr>
<tr>
<td>X−</td>
<td>0</td>
</tr>
</tbody>
</table>

Examples:
Some examples of using this grading scheme are shown below:

<table>
<thead>
<tr>
<th>Student</th>
<th>Fundamental Outcomes Mastered</th>
<th>General Outcomes Mastered</th>
<th>RATs &amp; Participation</th>
<th>Reflections Completed</th>
<th>Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angela Davis</td>
<td>8</td>
<td>29</td>
<td>95%</td>
<td>5</td>
<td>A−</td>
</tr>
<tr>
<td>Leonard Bernstein</td>
<td>8</td>
<td>25.5</td>
<td>90%</td>
<td>13</td>
<td>B+</td>
</tr>
<tr>
<td>Thomas Friedman</td>
<td>6</td>
<td>21</td>
<td>100%</td>
<td>8</td>
<td>D</td>
</tr>
</tbody>
</table>

More on grading →
Grading Details:

- **Mastery Grading:** We have a list of Content Outcomes for the course (8 Fundamental Outcomes and 30 General Outcomes). Every Friday, you will have an opportunity to demonstrate mastery of the outcomes we have studied so far in the course. For any given outcome, you must earn credit on **two different Fridays** to demonstrate mastery. Your base letter grade is determined primarily by the number of outcomes of each type that you master, as shown on the table on the previous page.

  We will *not* provide make-ups for Friday Assessments, since there are so many opportunities during the semester to attempt the outcomes and missing an opportunity doesn’t count against you. (But do not miss Fridays lightly – getting behind on your outcomes can make it difficult to catch up.)

  The **Final Exam** time scheduled by the registrar will be used as one last Friday Assessment.

- **RATs & Participation:** This score includes student and team performance on the Readiness Assessments Tests (RATs) and class participation. Each of our nine Modules will have one RAT day and about three class activity days.

  - Each individual RAT is worth 10 points and each team RAT is worth an additional 10 points. **No make-up RATs will be given.** If you are absent, you will receive a 0 for both the individual and team RAT that day. However, your 3 lowest RAT Scores (team or individual) will be dropped.

  - On regular class days, teams will **take their own attendance** to determine class participation. If you are marked as attending class, you will earn 10 points for that day. If you are unable to attend class for some reason, it is up to the discretion of your team whether to sign you in and earn you points for that day. You will need to communicate with your team about when you will be absent and what you will do for your team to make up for any absences.

  - **Modifier:** At the beginning of the semester, your team will determine Team Norms – rules for making your team effective. About half-way through the semester, everyone on your team will assess the contributions of all team members, including whether they are following your Team Norms. This midterm feedback will not affect your score, but will help you to learn how you can be a better teammate. At the end of the semester, everyone will complete the same assessment, and the resulting scores *will* modify your overall RATs & Participation score.

- **Reflections:** These will be graded on a “good faith effort” basis – if you have thought and written carefully in response to the prompt, you will earn credit for that reflection. The number of reflections for which you receive credit will determine whether you earn a ‘−’, neutral, or ‘+’ version of your base letter grade. Note that some reflections have due dates while others can be completed at any time. Many will ask you to complete a task first (e.g., making a weekly calendar for yourself or visiting office hours at least 3 times) before writing the reflection, so plan ahead!

  If you have questions about how this course is graded, please do not hesitate to reach out to your instructor!
Resources to help you succeed!

Reading Guides and Additional Practice Problems:
For each module, a reading guide will be available on LATTE to help guide you through the most important material of each section. There will also be additional practice problems with solutions that you can use to study for Friday Assessments. Each of these resources is optional, but you are encouraged to utilize them!

Office Hours:
You are encouraged to attend the office hours of your instructor and TA. If you can’t attend office hours, don’t hesitate to ask for an appointment for another time. I am happy to meet with you!

Evening Help Sessions:
You are welcome (and encouraged!) 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.

Calculators:
Calculators are not allowed during RATs or Friday Assessments. But your team will sometimes need to have access to a graphing calculator during class (an online one is fine, for example: http://wolframalpha.com).

Four-Credit Course:
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.).

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 your instructor to use, please send them an email to let them know.
Topics Covered in Math 5a (Precalculus):

Readings from the Yoshiwara text are labelled with a Y and readings from the Abramson text are labeled with an A.

Module 0: Factoring
- A Section 1.5 Factoring Polynomials
- Y Section 6.1 Factors and x-Intercepts

Module 1: Trig I
- A Section 7.1 Angles
- A Section 7.2 Right Angle Trigonometry
- A Section 7.3 The Unit Circle
- A Section 7.4 The Other Trig Functions

Module 2: Power Functions
- Y Section 3.1 Variation
- Y Section 3.1 Integer Exponents
- Y Section 3.3 Roots and Radicals
- Y Section 3.4 Rational Exponents
- Y Section 4.3 Logarithms

Module 3: Functions and Graphs
- Y Section 1.1 Linear Models
- Y Section 1.2 Functions
- Y Section 1.3 Graphs of Functions
- Y Section 1.4 Slope and Rate of Change
- Y Section 1.5 Linear Functions

Module 4: More on Functions
- Y Section 2.1 Nonlinear Models
- Y Section 2.2 Some Basic Functions
- Y Section 2.3 Transformations of Graphs
- Y Section 2.4 Functions as Mathematical Models
- Y Section 2.6 Domain and Range

Module 5: Exponential Functions
- Y Section 4.1 Exponential Growth and Decay
- Y Section 4.2 Exponential Functions
- Y Section 4.4 Properties of Logarithms
- Y Section 4.5 Exponential Models

Module 6: Logarithmic Functions
- Y Section 5.1 Inverse Functions
- Y Section 5.2 Logarithmic Functions
- Y Section 5.3 The Natural Base
- Y Section 5.4 Logarithmic Scales

Module 7: Polynomials and Rational Functions
- Y Section 6.1 Factors and x-Intercepts
- Y Section 6.2 Solving Quadratic Equations
- Y Section 6.5 Quadratic Inequalities
- Y Section 7.1 Polynomial Functions
- Y Section 7.4 Graphing Rational Functions
- Y Section 7.5 Equations That Include Algebraic Fractions

Module 8: Trig II
- A Section 8.1 Graphs of the Sine and Cosine Functions
- A Section 8.2 Graphs of the Other Trig Functions
- A Section 9.5 Solving Trigonometric Equations

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

Now email your instructor with your favorite joke to show that you have read the syllabus!