

Department of Economics  
Barnard College  
Fall 2020 (online)

Economics BC 1007: Mathematical Methods for Economics

Professor Sharon G. Harrison

**Course description:** This class will cover the mathematics you need to succeed in Intermediate Macroeconomics, Intermediate Microeconomics, and upper level electives in Economics. We start with the basics: algebra, solving equations, and graphing. Other topics include differentiation, functions and optimization. We will make extensive use of examples in Economics to solidify the concepts. These include equilibrium, marginal concepts, and elasticities as well as unconstrained and constrained optimization.

**Learning Objectives:** Upon completion of this course, you will be able to:

1. Show fluency in the basic concepts, models and tools of microeconomics and macroeconomics.
2. Recognize the applicability of particular tools to particular problems in microeconomics and macroeconomics.
3. Recognize the multiple approaches – algebraic, graphic and intuitive – to understanding the solution to a problem in microeconomics and macroeconomics.
4. Work cooperatively with others to solve problems in microeconomics and macroeconomics.

**Course prerequisites and sequencing:** There are no prerequisites for this class. This course focuses on preparation for Intermediate Microeconomics, BC 3035. Therefore, you may not take this course if you have already taken BC 3035, or its equivalent. The material covered will be repetitive for you.

**Class meetings:** This class will meet on zoom on Mondays and Wednesdays from 10:10 to 11:25 am. Each class meeting will be recorded.

**Contact Information:** Please e-mail me at [sh411@columbia.edu](mailto:sh411@columbia.edu).

**Courseworks:** Assignments, important announcements, and other information will be posted throughout the semester on the courseworks page for this class (go to <https://courseworks.columbia.edu/>).

**Office Hours:** TBA.

**Textbook:** The required text for this class is: *Essential Mathematics for Economics and Business*, fourth edition, by Teresa Bradley. You can purchase a hard copy version if you prefer, or an e-copy at: <http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP003102.html#student>.

**Class meetings:** This is a lecture class, but in order for you learn the material, it is important to me that you participate. The best way for you to learn math,, and its applications, is to do problems yourself. Hence, I will strive to dedicate part of each class to some sort of active learning. I will take advantage of zoom break-out rooms, and ask you to solve *in-class problems* based on the lecture material. After class, the solutions to these will be posted on courseworks.

**Evaluation:** Almost every Wednesday, we will have very short *in-class quizzes*, on material from the previous week. (See below for the schedule, there will be 11 of these in total.) These are meant to be short, low-stakes quick check-ins, to make sure that you are keeping up with the material. They will comprise **20%** of your grade. We will also have 4 take-home (done outside of class time) quizzes, These will be longer, deeper dives into the material, and will count for **30%** of your grade. I will drop your lowest score on each of the two types of quizzes so that only 10 in-class quizzes and 3 take-home quizzes will count. We will also have a take-home midterm exam and a take-home final exam, each of which will count for **25%** of your grade. The midterm exam will be due on Wednesday, October 21 and the final exam will be due during final exam period. Details to follow. Every assignment will be open book, more details to follow.

**Other course materials:** I will also post weekly-ish *Sample Problems*, and solutions to follow a few days later. These will not be graded. I recommend that you work on them in a timely manner, as additional preparation for quizzes and exams.

**Teaching assistant:** Your teaching assistant is John Park. His email address is [jjpark@barnard.edu](mailto:jjpark@barnard.edu). He will hold weekly recitation sections and office hours. Times will be decided during the second week of class. Section meetings are mandatory, and attendance will be taken. However, if you cannot make the scheduled time, you can come to office hours instead. He will also be responsible for grading your quizzes; and he will discuss his policies with you during the first week of recitation section. **Please email him not me**, with any issues regarding grading of quizzes.

**Honor code:** I value Barnard's Honor Code for the integrity it fosters. The Honor Code was established in 1912 and updated in 2016. All exams and assignments in this class are to be completed in accordance with the Barnard Honor Code. Columbia students commit themselves to the Honor Code upon registering for a Barnard course. The codes says, in part:

“We affirm that academic integrity is the honorable creation and presentation of our own work. We acknowledge that it is our responsibility to seek clarification of proper forms of collaboration and use of academic resources in all assignments or exams. We consider academic integrity to include the proper use and care for all print, electronic, or other academic resources. ”

Please note that The Barnard Honor Code includes relevant language for the proper use of electronic class material: any recorded class content is the intellectual property of your professor and your fellow students, and should not be distributed or shared outside of class

**Students with Disabilities:** From the Center for Accessibility Resources & Disability Services (CARDS): "If you are a Barnard student with a disability, we encourage you to register with us, even if you are not sure whether you'll need accommodations. Registration with CARDS is confidential and can serve as a type of insurance policy for you in the event of a flare-up or other disability-related need. . . Please note that accommodation plans are not intended to be retroactive, so we can only set up accommodations for your classes or exams after you have your intake meeting with us. . . It is important to register with CARDS early in the semester to use your accommodations for all your coursework." If you are registered with CARDS, please email me so we can discuss your accommodations for this course. Students are not eligible to use their accommodations in this course until they have met with me.

**Wellness Statement:** It is important for undergraduates to recognize and identify the different pressures, burdens, and stressors you may be facing, whether personal, emotional, physical, financial, mental, or academic. We as a community urge you to make yourself—your own health, sanity, and wellness—your priority throughout this term and your career here. Sleep, exercise, and eating well can all be a part of a healthy regimen to cope with stress. Resources exist to support you in several sectors of your life, and we encourage you to make use of them. Should you have any questions about navigating these resources, please visit these sites: [http://health.columbia.edu/files/healthservices/pdf/alice\\_Stressbusters\\_Support\\_Network.pdf](http://health.columbia.edu/files/healthservices/pdf/alice_Stressbusters_Support_Network.pdf); <http://barnard.edu/primarycare>; <http://barnard.edu/counseling>; <http://barnard.edu/wellwoman/about>;

**Affordable Access to Texts Statement:** All students deserve to be able to access course texts. The high costs of textbooks and other course materials prohibit access and perpetuate inequity, and Barnard librarians are partnering with students, faculty, and staff to increase access. By the first day of advance registration for each term, you should be able to view on CourseWorks information provided by your faculty about required texts (including ISBN or author, title, publisher and copyright date) and their prices. Once you have selected your classes, here are some cost-free methods for accessing course texts, recommended by the Barnard Library: find out if your faculty has placed the texts on reserve at Barnard Library or another Columbia library, and look for course texts using CLIO (library catalog), Borrow Direct (request books from partner libraries), Interlibrary Loan (request book chapters from any library), and NYPL. Students with financial need or insecurity can check items out from the FLIP lending libraries in the Barnard Library and Butler Library and can consult with the Dean of Studies and the Financial Aid Office about additional affordable alternatives for getting access to course texts. Talk with your librarian and visit the Barnard Library Textbook Affordability guide ([library.barnard.edu/textbook-affordability](http://library.barnard.edu/textbook-affordability)) for more details.

Note: this semester there is no physical copy of the text on reserve at the Barnard library. Hard copy and electronic FLI options are available. Please contact me for more information.

**Other class policies:**

1. Please have a calculator with you for every class. Please use a scientific calculator. You must be able to calculate logarithms and exponentials with your calculator. Please do not use a graphing calculator, or your phone.
2. Your TA, John Park, will hold weekly recitation sections and office hours. Times will be decided during the second week of class. John will be responsible for grading all of the quizzes; and he will discuss his policies with you. Please address any questions about grading of quizzes to him, not me. John also composes and posts the answers to the quizzes and Sample Problems.
3. I will drop your lowest score on each of the two types of quizzes. Therefore 10 in-classes will count, and 3 take-home quizzes will count. Hence, there is no need to email me with requests for extensions on take-home quizzes, or make-up dates on in-class quizzes. If you cannot take an in-class quiz on the scheduled day or get a take-home quiz uploaded on time, I will likely recommend that you take advantage of this policy by dropping this grade, and planning to devote your full resources to the rest of the quizzes. If you think you have an exceptional situation, please let me know as soon as possible. I am available during office hours, or email me to make an appointment at another time.
4. As noted above, I make use of the courseworks page to communicate with you throughout the semester. I will post which Chapter(s) I plan to cover, and which sections I will skip. The default is that you are not responsible for sections I skip. I will let you know if instead you need to learn any material I skip in lecture. I will also post if an “emergency” comes up. For example, if I have to miss class unexpectedly, or if there is a typo in a take-home quiz, or in an answer to a Sample Problem.
5. Speaking of typos, there are many typos in the Bradley text book. Hence, I have compiled a list and posted it under “Miscellaneous” in “Files” on Courseworks. The page numbers match the hardcopy text, but they are a bit off for the e-book. Take note of these typos before you drive yourself crazy over something in the text book that seems wrong to you. If you do find another typo, please let me know.
6. Please note: the courseworks page may calculate a course grade for you, based on the entered assignment grades. This may or may not be a reflection of your actual course grade, as it may weight every assignment equally, and I put different weights on them, as noted above.
7. Jewish and other holidays: please let me know as soon as possible if you anticipate missing any classes or quizzes due to a religious holiday. I can plan accordingly.
8. Please note that, in order to minimize anxiety on your part, after I submit final grades, I will not respond to emails regarding them.

## (Rough) Schedule of Topics to be Covered

(Chapter numbers in (.) )

(Check courseworks regularly for updates)

*WEEK 1:* September 9:

- Preliminaries (1)
  - Arithmetic operations and fractions
  - Solving equations
  - Working with percentages

*WEEK 2:* September 14, 16:

- Graphing Linear Equations (2)
  - The equation of the line
  - Graphs
  - Applications: supply and demand
- Simultaneous equations (3)
  - Two equations in two unknowns
  - Three equations in three unknowns
  - Applications: equilibrium and its implications

*WEEK 3:* September 21, 23:

- Non-linear equations (4)
  - Quadratic, exponential and logarithmic functions
  - Applications: growth

*WEEK 4:* September, 28, 30:

- Differentiation (6)
  - Definition and rules

*WEEK 5:* October 5, 7

- Applications of Derivatives (6)
  - Marginal functions

*WEEK 6:* October 12, 14:

- Applications of Derivatives cont'd (6)
  - Optimization
  - Applications: utility, output, revenue, profit, and cost

*WEEK 7:* October 19, 21:

- Applications of Derivatives cont'd (6)
  - Curvature and second derivatives: utility, output, revenue, profit, and cost
- **Wednesday, October 21: Midterm Exam due (take-home)**

*WEEK 8:* October 26, 28:

- Product rule, Quotient Rule and Chain Rule (6)

*WEEK 9:* November 2, 4:

- **Monday, November 2: Election Day Holiday**
- Functions of several variables (7)
  - Partial derivatives

*WEEK 10:* November 9, 11:

- Functions of several variables cont'd (7)
  - Production functions and isoquants

*WEEK 11:* November 16, 18:

- Functions of several variables cont'd (7)
  - Utility functions and indifference curves

*WEEK 12:* November 23, 25

- **Wednesday, November 25: Thanksgiving Holiday**
- Functions of several variables cont'd (7)
  - Unconstrained optimization
  - Applications: total cost, total revenue, profit

*WEEK 13:* November 30, December 2

- Functions of several variables cont'd (7)
  - Constrained optimization
  - Application: utility

*WEEK 14:* December 7, 9

- Functions of several variables cont'd (7)
  - Constrained optimization
  - Applications: output, revenue

*WEEK 15:* December 14

- Functions of several variables cont'd (7)
  - Elasticities

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In-class quizzes: Will be short, at the start of class, on Wednesdays. Here is the schedule:

Sept 16	Oct 14	Nov 18
Sept 23	Oct 28	Dec 2
Sept 30	Nov 4	Dec 9
Oct 7	Nov 11	

Take-home quizzes: Will be ready a week in advance and due at 11:59 pm on the date indicated. You will scan and upload your solutions on the courseworks page. Here is the schedule:

Friday, Sept 25
Friday, Oct 16
Friday, Nov 20
Friday, Dec 11

I will drop your lowest score on each of these quizzes. Therefore, 10 in-classes will count, and 3 take-home quizzes will count. Hence, there is no need to email me with requests for extensions on take-home quizzes, or make-up dates on in-class quizzes. If you cannot take an in-class quiz on the scheduled day or get a take-home quiz uploaded on time, I will likely recommend that you take advantage of this policy by dropping this grade, and planning to devote your full resources to the rest of the quizzes. If you think you have an exceptional situation, please let me know as soon as possible. I am available during office hours, or email me to make an appointment at another time.