ECON 1078-002

Math Tools for Economists 1

MWF 10:00 am - 10:50 am in ECON 119

Teacher: Akhil Rao

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Class website: D2L
Oce location: ECON 414
Oce Hours: MW 9-10am, W 2:15-3:15pm, and by appointment

This syllabus will guide our class, but it is not set in stone. I will update it throughout the semester to ensure that it reects our goals and progress.

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the rst time.

T.S. Eliot, Little Gidding

Course Description: This course is the rst of two courses designed to give you the mathematical background necessary for future courses in business and economics. Topics to be covered in this course include basic college-level algebra, simple linear and nonlinear equations, functions and their graphs, systems of equations, set theory, summation, logic, and proofs.

Text: *Essential Mathematics for Economic Analysis*, 4th Edition
Authors: Knut Sydsaeter, Peter Hammond, and Arne Strom

Course Objectives:
After taking this class, you should have an understanding of:

1. Basic \college" algebra: including real numbers, integer powers, basic algebraic identities and expressions, factoring, fractions, rational exponents, inequalities, intervals and absolute values.
2. Equations: including how to solve simple linear equations (with parameters), systems of two linear equations, quadratic equations and other non-linear equations.
3. Set theory, an introduction to logic (including necessary and su cient conditions), and proof writing.
4. Summation notation and working with summations (vital for Econ 3818).

and the following topics relating to functions:

1. The basics: Includes the de nition of a function, notation, domain and range, and graphs of functions.
2. Linear functions: Includes slopes, the general equation for a straight line, slope-intercept form, graphing, linear inequalities, and linear models.

3. Quadratic functions and how they can apply to economic models (e.g. a simple monopoly model, a simple least-squares problem).
4. Polynomials: Includes factoring polynomials, division, and rational functions (these skills are often employed in Econ 3070).
5. Exponential and logarithmic functions used extensively in intermediate economics courses (e.g. when presenting positive, monotonic transformations).
6. Important function properties and techniques: Includes products and quotients, shifting functions, and composite functions.

When in doubt, consult the syllabus. Email me if it doesn't answer your question(s). Please allow me at least 24 hours to respond.

Course Expectations:
You can expect me to

be prepared for the day's work and do my best to assist you in your course work;

treat you fairly, professionally, and respectfully at all times;

be available and attentive during o ce hours, and respond to emails within 24 hours.

I expect you to

regularly attend class, be punctual, and silence your phone(s);

complete all assignments and turn them in on time;

be respectful to and cooperate with your classmates and I;

ask questions about the material.

Course Policies:

General

{ Computers are not to be used for purposes other than note-taking, unless instructed to do so.

{ Exams are closed book, closed notes. All you will need are pens or pencils.

{ The weekly coverage might change as it depends on the progress of the class. You are responsible for checking the syllabus/D2L/your email/in-class announcements for assignment due dates.

Notes

{ I do not distribute my lecture notes. I will ask you to do practice problems during class. Bringing a notebook and pencil to work these out is a good idea.

{ You are responsible for obtaining the notes from lecture. If you must miss lecture for any reason, please get the notes from a classmate.

Assignments

{ I will create 8 take-home problem sets. You may use your lecture notes, your textbook, and your computer to work out these problems. Each problem set will be graded on a scale of 0-5 points: 2 points for completeness, and 3 points for correctness on selected questions which I will grade in detail. Occasionally a problem set will be for 10 points, in which case 4 points will be for completeness and 6 points for correctness on selected problems. **Submit these on D2L **AS A SINGLE FILE** before class starts or they will be considered late**.

{ I will assign readings throughout the semester. You will be responsible for turning in typed summaries of the readings on D2L. The summaries must be at least half a page, and may be up to 1 page. They will be graded on a scale of 0-1: 0 if incomplete, 1 if complete. The summaries should cover the content of the readings, but also a little of what you thought of them. These summaries are so that I know you have done the readings. **Submit these on D2L**.

{ Your total assignments grade will combine your scores on all of the problem sets and the reading summaries.

{ Information about assignments will be given in class, on the syllabus, and on D2L. You are responsible for keeping track of assignment due dates and submission guidelines.

{ **No late assignments will be accepted under any circumstances**.

Attendance

{ Attendance is expected and will be taken via clicker beginning in week 2. Your lowest 3 clicker scores will be dropped.

{ Each clicker question will be worth 3 points: 2 for attendance, and 1 for correctness.

{ Students are responsible for all missed work, regardless of the reason for absence.

{ Using multiple clickers to answer a question for someone who is absent is not allowed. Such instances will be treated as cheating by all involved, and followed up on accordingly.

Computers, calculators, and clickers

{ I encourage you to use tools like graphing calculators/websites and computer algebra systems to better understand the material and work through the problem sets. However, \because my calculator said so" is not a good enough answer to a question with computations. Show me that you understand the mechanics.

{ Cell phone calculators and graphing calculators are not allowed during exams. Calculators without graphing capability or a programmable memory are allowed during exams.

{ **Using computers in class for anything other than taking notes is strictly prohibited.** The rst time I see you using a computer for something else, I will ask you to put the computer away. Repeated infractions will result in stronger penalties at my discretion.

{ You may work with your classmates to solve in-class clicker questions, unless instructed otherwise for particular questions.

O ce hours

{ I encourage you to come to my office hours to discuss any of the material from lecture. Please bring notes and specific questions.

{ If the posted office hours don't work for you, email me and we will set up an appointment.

I reserve the right to modify the policies listed above.
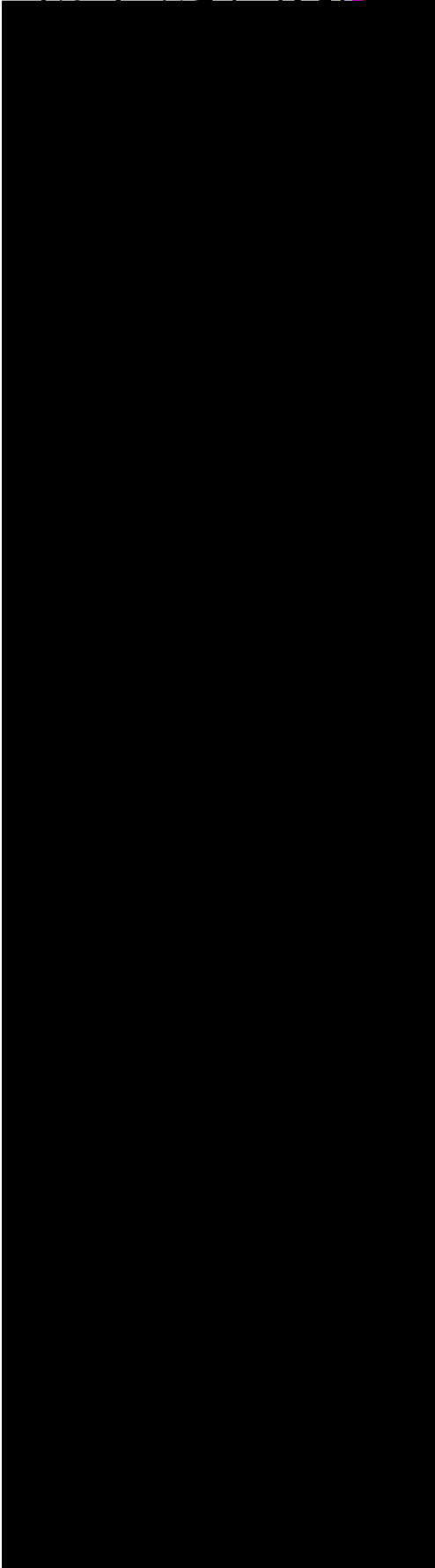
Grading Framework:

Clicker questions	10%
Assignments	30%
Midterm exam 1	15%
Midterm exam 2	15%
Final Exam	30%

Letter Grade Distribution:

>= 94.00	A	73.00 - 76.99	C
90.00 - 93.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	<= 59.99	F

Additional

nationalities. Class rosters are provided to the instructor with the student's legal name. I will

(*Left:* A true story.)

Many of us struggle with math at some point in our lives. The goal of this class is to help you develop your ability to do math. If you're struggling with something - that's ok! Many of the mathematical concepts and

Course Schedule:

Week	Content
Week 1 (1/17, 1/19)	Course material: 1.1, 1.2, 1.3 Topics: Numbers, Integer powers Assignments: Read *The Imaginary That Isn't*
Week 2 (1/22, 1/24, 1/26)	Course material: 1.4, 1.5 Topics: Rules of algebra, Fractions, Fractional powers Assignments: PS1 issued 1/22
Week 3 (1/29, 1/31, 2/2)	Course material: 1.6, 1.7, 2.1 Topics: Inequalities, Intervals and absolute value, Simple equations Assignments: Reading summary and PS1 due 1/29, PS2 issued 2/2. Read *Polya's Problem Solving Techniques*.
Week 4 (2/5, 2/7, 2/9)	Course material: 3.4, 3.5, 3.6 Topics: Logic, Proofs, Set theory Assignments: Reading summary, Read *How to Prove It* pages 84-93
Week 5 (2/12, 2/14, 2/16)	Course material: 2.2, 2.3, 2.4 Topics: Equations with parameters, Quadratic equations, Linear equations in two unknowns Assignments: Reading summary and PS2 due 2/12
Week 6 (2/19, 2/21, 2/23)	Course material: Review, **Exam 1 (Wednesday 10/4)**, 2.5 Topics: Nonlinear equations Assignments: PS3 issued 2/23, Read *How to Solve It* pages 174-179
Week 7 (2/26, 2/28, 3/2)	Course material: 4.1, 4.2, 4.3 Topics: Functions, Graphing Assignments: Reading summary, PS3 due 3/2
Week 8 (3/5, 3/7, 3/9)	Course material: 4.4, 4.5, 4.6 Topics: Linear functions, Quadratic functions Assignments: PS4 issued 10/16
Week 9 (3/12, 3/14, 3/16)	Course material: 4.7, 4.8, 4.9 Topics: Polynomials, Power functions, Exponential functions Assignments: PS4 due 3/16
Week 10 (3/19, 3/21, 3/23)	Course material: 4.10, 5.1, 5.2 Topics: Logarithmic functions, Shifting graphs, New functions from old Assignments: PS5 issued 3/19
Week 11 (Spring Break)	
Week 12 (4/2, 4/4, 4/6)	Course material: Review, **Exam 2 (Wednesday 4/4)**, 5.3 Topics: Inverse functions Assignments: PS5 due 4/2; PS6 issued 4/6
Week 13 (4/9, 4/11, 4/13)	Course material: 5.4, 5.5, 5.6 Topics: Graphing equations, Distance in the plane, General functions Assignments: PS6 due 4/13; PS7 issued 4/13
Week 14 (4/16, 4/18, 4/20)	Course material: 3.1, 3.2, 3.3 Topics: Summation notation, Rules of sums, Double sums Assignments: PS7 due 4/20; PS8 issued 4/20
Week 15 (4/23, 4/25, 4/27)	