

Mathematical Economics

Lecture 1/1: Introduction

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Sogang University

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Agenda

1. Introduction
2. Course Overview
3. What is Mathematical Economics?

1. Introduction

Course Information

- **Course Title:** Mathematical Economics
- **Course Credit:** 3
- **Designed for:** 1st-year students
- **Course Prerequisites:** None
- **Semester:** Spring 2025
- **Meeting Venue and Time:** UPD | Wed./Fri. | 13:30-14:45

Introductions

- Let's start with a little introduction:
 - What's your preferred name?
 - Where are you from?
 - Any fun fact to share (e.g. hobbies or interests, favorite quote, e.t.c.)?
 - A brief *expectation survey*. [link](#)

About me

Hello! My name is **legor**.

- Assistant Professor ([link](#)), Sogang University
- Ph.D. (Public Policy), KDIS (ROK, 2022)
- M.A. (Public Policy), KDIS (ROK, 2014)
- M.A. (International Economics), KNEU (Ukraine, 2009)
- B.A. (International Economics and Management), KNEU (Ukraine, 2008)
- Background: International banking & central banking
- Roles: Financial Analyst, Team-lead, Project manager

Some Info:

- email: ievysh@sogang.ac.kr
- office: TBU
- [Google Scholar](#)
- [Linkedin](#)
- [ResearchGate](#)
- [GitHub](#)
- *Research interests*: central banking, computational data science
- *Hobbies*: research, martial arts, cycling, etc.

2. Course Overview

Course Description:

- **Designed for Incoming Students:** Provides basic background knowledge on mathematical methods essential for success in international economics, business, and financial studies.
- **Core Topics Covered:** Introductory algebra, differentiation, matrix analysis, and optimization—building a strong foundation for analytical decision-making in the global economy.
- **Applied Focus:** Emphasizes economic and statistical applications rather than mathematical proofs or detailed theorem derivations.
- **Mathematics is Fun!:** More than just a tool for solving real-world problems, this course makes learning math engaging and enjoyable.

Course Objectives:

Students will apply the following mathematical concepts to economics, business, and finance:

- **Graphs of Functions** – Visualizing relationships
- **Solving Equations** – Linear and nonlinear solutions
- **Differentiation** – Rates of change and marginal analysis
- **Optimization** – Comparative statics and partial differentiation
- **Integration** – Basic concepts
- **Linear Algebra** – Matrices for economic modeling

Course Learning Outcomes:

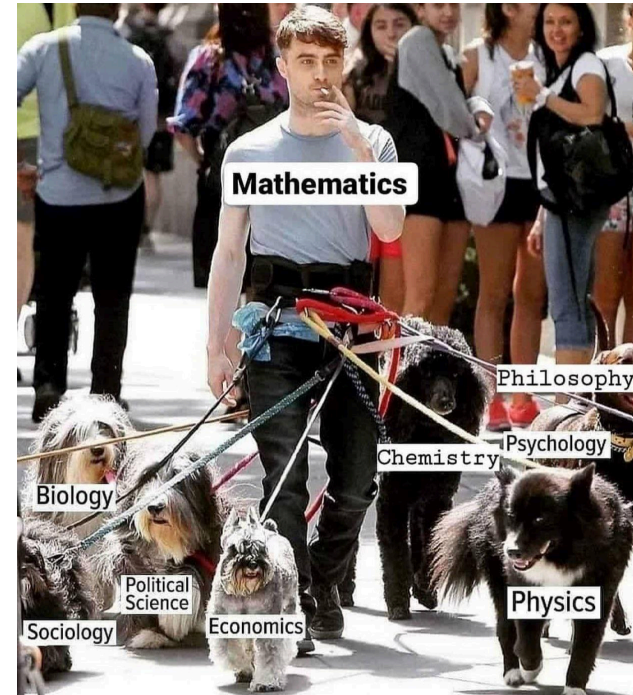
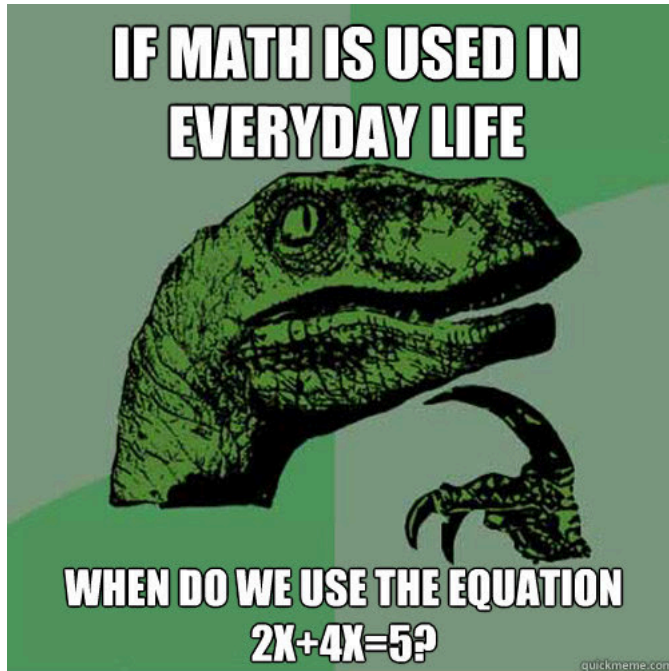
By the end of this course, students will be able to:

- Analyze mathematical functions in economic and business contexts.
- Solve linear and nonlinear equations for real-world applications.
- Apply differentiation for optimization and economic analysis.
- Use comparative statics and partial differentiation in decision-making.
- Perform basic integration for economic modeling.
- Apply matrix algebra to solve systems of equations.
- Develop problem-solving skills using mathematical reasoning.
- Recognize that mathematics is both useful and fun!

The course in a nutshell

1. Mathematics basics (needed minimum for economics)
2. Practical implication (class & home assignments)

Math in Our Life?



Source: Internet Memes

Broad coverage

- **Formal/core curriculum:**

- Concepts
- Understanding
- Real-life cases
- Problem-solving
- Application

- **Hidden curriculum:**

- Values
- Standards
- Communication
- Cooperation
- Discussions

Teaching method

The course consists of lectures, in-class activities, and demonstrations that emphasize hands-on, practical tasks that give students the chance to put what they have learned to the test and improve their skills.

- In-class lectures and exercises
- Post-class problem sets (each assignment consists of 5-10 short questions)
- TA sessions before quizzes and exams
- For some classes, pre-class online preview (15-30 min. recorded lecture and/or related video materials) will be provided.

Course materials:

- Lecture notes
- Jacques, Ian (2023) **Mathematics for Economics and Business**, 10th ed., Pearson. Any previous edition would be also fine.

GRADING

- *Class Participation*: 10%
- *Home Assignments*: 10%
- *Quizzes*: 30%
- *Midterm Examination (Week 8)*: 25%
- *Final Examination (Week 16)*: 25%
- **Total**: 100%

More details on each item you will get down the road.

Remember, I'm not giving you grades; you're earning them.

Course Policies

- **Academic Integrity:** The University's Honor Code and Academic integrity will be strictly reflected. Plagiarism results in zero credit and an F-grade for the course.
- **Class Policy:** No photos or videos allowed; lecture slides are provided before class.
- **Communication:** Use CLASSUM for discussions and Q&A. Engage early to benefit from collective knowledge. Private questions are allowed. Details will be provided in the first class.

Course roadmap

| Week | Topic |
|---------|--------------------------------------------------------------------------------------------------------------------|
| Week 1 | Course Introduction: Why study mathematics? Basic Algebra. |
| Week 2 | Graphs of Equations, Solving Equations, Supply & Demand, Transposition of Formulae, National Income Determination. |
| Week 3 | Quadratic Functions, Revenue, Cost & Profit, Indices & Logarithms, Exponential & Natural Log Functions. |
| Week 4 | Percentages, Compound Interest, Easter Holiday, Geometric Series, Investment Appraisal |
| Week 5 | Derivative of Functions, Rules of Differentiation, Quiz #1 |
| Week 6 | Marginal Functions, Further Rules of Differentiation, Elasticity |
| Week 7 | Optimization of Economic Functions, Derivatives of Exponential & Natural Log Functions |
| Week 8 | Mid-term |
| Week 9 | Functions of Several Variables, Partial Elasticity & Marginal Functions |
| Week 10 | Comparative Statics, Unconstrained Optimization |
| Week 11 | Constrained Optimization, Lagrange Multipliers |
| Week 12 | Indefinite Integration, Definite Integration |
| Week 13 | Quiz #2, Basic Matrix Operations, Matrix Inversion |
| Week 14 | Cramer's Rule, National Holiday (Memorial Day), Linear Programming |
| Week 15 | Applications of Linear Programming, Difference Equations, Differential Equations |
| Week 16 | Final Exam |

Tentative schedule. It may be adjusted based on the class background and progress.

General things

- **Our Goals:**
 - to learn the basics of Mathematical Economics
 - to apply the knowledge in real-life scenarios
 - see that *Math* is fun :-)
- **Our Principle:**
 - learning by doing
 - mutual respect
 - put one's efforts
- **My role:** to guide you through the course, i.e. **mentoring and facilitating**
- Your suggestions are welcomed (through KSS survey, etc.): **KSS**

Our communication

- Check the website regularly for materials and messages
- Feel free to approach me before or after our class
- **Office hours:** W10-12, Thu10-12, F2-4 or by appointment. You are welcome to discuss course-related issues and questions, career plans, etc.
- Check / use **CLASSUM** (incl. messages in-there)
- **Emailing policy:** email me to set up a one-to-one meeting or in the case of some urgent issues.
 - Please indicate the course name in the subject line and the issue (e.g., *[Mathematical Economics]* Meeting request)
 - Please write at least two times when you would like to meet and a brief description (1-2 sentence) why you want to meet up with me
 - I may not reply on time (so email me in advance)

Disclaimer

- This is my first course with Sogang, so I will likely be making changes as we go
- Please check the course website regularly for updates

Course Overview

Questions?

- Any questions about the course?
- Any questions about the syllabus?

Study Suggestions

1. Reading materials before class
2. Participate (10% of your grade) and ask questions.
3. Be active in class (don't miss and do in-class activities)
4. "The best way to learn ... is to stay on top of it as you go along. The worst way is to cram the night before exams." (c)

Common Challenges Students Face

1. Lack of Interest
2. Language Barrier
3. Personal Challenges
4. Math Anxiety / PTSD

Based on Gaston Sanchez' [lectures](#)

1. Lack of Interest

- Great indifference
- Missing lectures
- Coming/leaving late/early
- No in-class activities
- Doing something else in class
- Cheating / free riding

DROP IT

2. Language Barrier

- Trouble with listening/reading comprehension
- Poor vocabulary
- Hard time with new terminology

It's okay, just push harder

No worries; it's not a language class.

Please use some online speech/voice translation tools to help you like [Online Voice Translator](#) or any others.

3. Personal Challenges

- Health
- Family
- Job
- Universe against you

Come talk to me ASAP

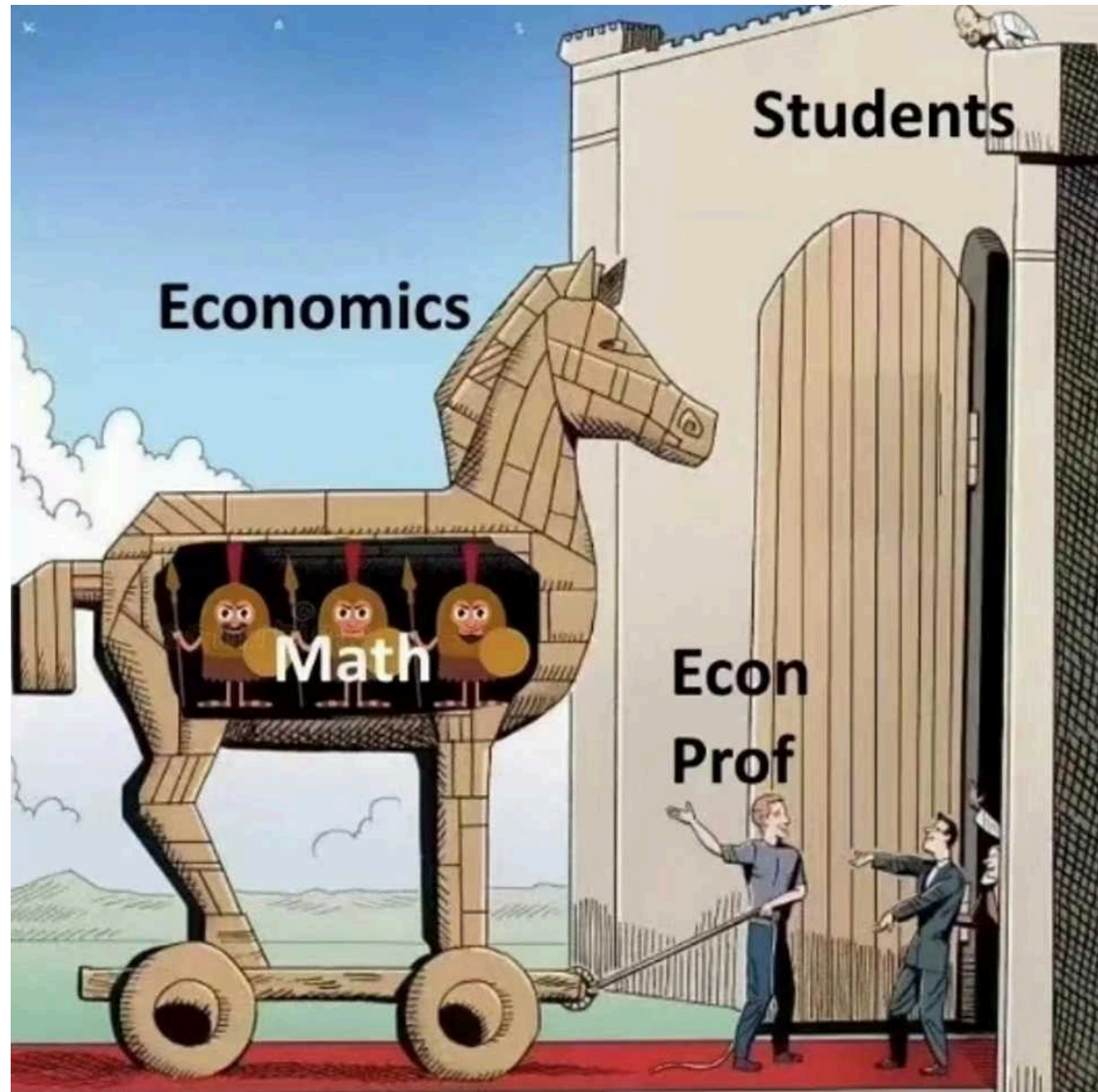
4. Math Anxiety / PTSD

- Traumatic math experiences
- Can't operate numbers
- Don't see econ linkages

Just patience & work harder

3. What Is Mathematical Economics?

Why Mathematical Economics?



What is Mathematical Economics?

- The use of mathematical methods to **understand and solve economic problems**.
- Helps economists build models, analyze relationships, and test theories with precision.
- Transforms complex economic ideas into clear, logical, and measurable frameworks.

Why study Mathematical Economics?

- *Clarity & Precision* – Translates economic concepts into clear, logical models.
- *Better Decision-Making* – Helps analyze and solve real-world economic problems.
- *Stronger Analytical Skills* – Enhances problem-solving and critical thinking.
- *Career Advantage* – Essential for finance, business, policy analysis, and research.
- *Foundation for Advanced Studies* – Prepares for econometrics, optimization, and economic theory.

Why study Mathematical Economics?

For example:

- *Supply & Demand Analysis* – Uses equations and graphs to predict market behavior.
- *Interest & Investment Calculations* – Helps determine loan payments, savings growth, and investment returns.
- *Cost & Profit Optimization* – Businesses maximize profits by applying differentiation to revenue and cost functions.
- *Inflation & Economic Growth Models* – Governments use mathematical models to forecast inflation and GDP growth.
- *Game Theory in Business & Politics* – Analyzes strategic decision-making in competitive environments.
- *Risk & Uncertainty in Finance* – Uses probability and statistics to assess financial risk and make informed investment decisions.

Any QUESTIONS?

Next Class

- (Mar 7) Basic Algebra (1.1, 1.2)