Mathematics Review Course

University of Minnesota
Department of Applied Economics

Summer 2023

Instructor:	Ryan McWay	**Time:**	MTWRF 9:00 – 12:00
Email:	mcway005@umn.edu	**Place:**	119 Ruttan Hall

Course Pages:

1. Primary Github Repository: https://github.com/mcwayrm/apec_math_review_2023
2. Canvas Site: TBA

Office Hours: After class, or you may reach out directly via email.

Course Description: This is a reviewer course for graduate-level mathematics skills for masters and doctoral students entering the Applied Economics (APEC) program in the Fall, 2023. Additionally, this course is open to similar incoming students from adjacent fields (Public Policy, Business, Health Economics, etc.). Through recitation and practice problems, this course will prepare students for the mathematical rigor of the core microeconomics theory (APEC 8001–04) and econometrics (APEC 8211–14) during the first-year sequence. Generally, will cover the following broad categories of mathematics will application to the economic science: set theory, topology, probability, statistics, algebra, calculus, proofs, linear algebra, and optimization.

This is a non-credit course. The course content consists of lectures, encouraged readings, supplementary reinforcing materials, and optional problem sets. This course will be offered in a hybrid format (in-person and online). I encourage in-person attendance.

Main References: This is a restricted list of various interesting and useful books that will be touched during the course. You need to consult them occasionally. These materials are readily available through internet archives, online bookstores, the university bookstore, as well as the department library (Waite Library).

Mathematics:

- [SB] Simon and Blume. (1987). *Mathematics for Economists.*
- [Chiang] Chiang: Fundamental Methods of Mathematical Economics.
- [Hammack] Hammack, R. (2013). *Book of Proof.* (Edition 2.1)
- [Velleman] Velleman: How to Prove It
- [B&S] Bartle, R. G., Sherbert, D. R. (2010). *Introduction to Real Analysis.* (3rd Edition)
- [Hansen Stats] Hansen. Probability and Statistics.
- [D&S] DeGroot and Schervish: Probability and Statistics
- [Strang] Strang: Linear Algebra and It's Applications

Microeconomics:

- [MWG] Mas-Colell, A., Whinston, M., Green, J. R. (1995). *Microeconomic Theory.*

- [Sundaram] Sundaram, R. K. (1996). *A First Course in Optimization Theory.*

Econometrics:

- [Hansen Metrics] Bruce E Hansen: Introduction to Econometrics
- [Greene] Greene: Econometric Analysis

Objectives: By the end of the course, students should be able to:

- Identify areas of weakness in mathematics, and be able to address them through individual study, practice, and seeking assistance appropriately.
- Understand the fundamentals of mathematics applications in economics.
- Comfortably perform proofs and optimization.
- Comfortably perform problem sets under time constraints.
- Confidence starting the first year sequence.

Important Dates:

Start of Course	August, 7th
End of Course	August, 25th
Start of Fall 2023 Academic Semester	September, Day ...

Problem Sets:

This course is optional and not graded. To reinforce material, and to determine for yourself deficiencies in your math background worth improving in particular, daily problem sets will be assigned corresponding with the material covered in each lecture. Completing these problem sets is optional and will not be graded. But it is highly encouraged. If you are struggling, this helps me identify the issue with better clarity.

Problem sets may be completed in groups, but are strongly encouraged to be first attempted individually. I highly recommend creating cohorts to assist with questions and comprehension of the material.

Solution sets will be made available via the Github repository the following day.

Tentative Course Outline:

Lecture		Topic	Encouraged Reading	Supplementary Material	Assignment
1	Aug. 7	Logic & Proofs	Ch.1 & 2	Article on Econ, Video with link	PS1
2	Aug. 8	Sets & Topology	Ch.3	Article on topic, Video with link	PS2
			Second article	More material	
3	Aug. 9	Derivatives	Ch.1 & 2	Article on Econ, Video with link	PS3
4	Aug. 10	Integration	Ch.1 & 2	Article on Econ, Video with link	PS4
5	Aug. 11	Multi-variate Calculus	Ch.1 & 2	Article on Econ, Video with link	PS5
6	Aug. 14	Functions	Ch.1 & 2	Article on Econ, Video with link	PS6
7	Aug. 15	Matrices	Ch.1 & 2	Article on Econ, Video with link	PS7
8	Aug. 16	Linear Algebra	Ch.1 & 2	Article on Econ, Video with link	PS8
9	Aug. 17	Optimizations	Ch.1 & 2	Article on Econ, Video with link	PS9
10	Aug. 18	Optimizations	Ch.1 & 2	Article on Econ, Video with link	PS10
11	Aug. 21	Probability	Ch.1 & 2	Article on Econ, Video with link	PS11
12	Aug. 22	Statistics	Ch.1 & 2	Article on Econ, Video with link	PS12
13	Aug. 23	Dynamic Programming	Ch.1 & 2	Article on Econ, Video with link	PS13
14	Aug. 24	TBA	Ch.1 & 2	Article on Econ, Video with link	PS14
15	Aug. 25	TBA	Ch.1 & 2	Article on Econ, Video with link	PS15

Course Policy:

- Enrollment will be determined via the list of participants provided the instructor through the APEC department. If you wish to be added, consult your program coordinator.

Class Policy:

- Regular attendance is essential and encouraged, but is optional. Attendance will be recorded.
- A regular zoom link will be available for remote access to this course. The link will be sent out via email. You may request the link via email if you have not received it.
- Lectures will not be recorded. If you wish to learn, attend the live session. Conflicting commitments may be seen as a minor inconvenience, as this course is a non-requisite for your graduate studies.
- The course material is the instructor's intellectual property. Dissemination is at the discretion of the instructor – Ryan McWay.

- Respect of your fellow classmates and the instructor is expected while in the classroom. You will be asked to leave if you are inconsiderate of your peers, or are disrupting the learning process.