University of Arizona Economics Department
Math Camp 2021

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The Economics Department's Math Camp is designed to prepare you for the Economics PhD program. The course will be conducted entirely online. A short introductory video is available at https://www.youtube.com/watch?v=IxjC6Z5cu_Q

The course will cover most of the concepts in Chapters 10-30 of *Mathematics for Economists* by Simon & Blume, which I'll denote as S&B. There are two other books that you'll find useful:

- *Book of Proof*, by Richard Hammack;
- *A First Course in Optimization*, by Rangarajan Sundaram.

The Hammack book (3rd edition) can be obtained in pdf form for free, online, at

https://www.people.vcu.edu/ rhammack/BookOfProof/Main.pdf

or as an actual physical book, from Amazon, for less than $25.

The course consists of video lectures, exercises, interaction online with Risheng and me and with the other students via Zoom and email, and the final exam. The course will begin on June 7 and end on (or possibly before) July 23.

The video lectures for the course are available on YouTube and in Dropbox, and the exercises that will be assigned during the course are available now as well. So if you wish to begin watching the lectures, and working on the exercises, you may do that anytime, at your own pace. There just won't be any interaction with Risheng and me, or most likely with the other students, until June 7. You're not *expected* to begin early, it's just an option that's available to you. (However, see below about some work that you *are* expected to do prior to June 7.)

You will receive a grade at the completion of the course. The grade will be reported to the Department but will not be an official University grade — it will not be reported to the University registrar. Your grade for the course will be the grade you receive on the final exam.

Before Math Camp begins:

In the weeks before June 7, you should work through Appendices A.1 to A.4 and the first 9 chapters of S&B, as well as the first two chapters of the Hammack book. This should be mostly review for you, but it's important to do. I suggest working through the four S&B appendices first. I've listed some exercises below that you should do as you're working through these chapters. The starred exercises in the list (the ones with asterisks, *) are to be turned in to be graded so we can provide you with feedback on how you're doing. You should turn them in by June 7; email your solutions, as a pdf, to Risheng and to me.

Exercises in Simon & Blume:

- **Appendix A.1:** A1.3*, A1.7*.
- **Appendix A.2:** A2.4, A2.11, A2.12*.
- **Appendix A.3:** A3.2, A3.8.
- **Appendix A.4:** A4.1, A4.2, A4.5, A4.6.
- **Chapter 2:** 1, 10*, 13*, 14, 17*, 18*, 20(abcgk), 23, 25.
- **Chapter 3:** 2, 8*, 10, 15, 18*.
- **Chapter 4:** 1, 2, 3, 5, 8, 9.
- **Chapter 5:** 2(ab), 4, 5, 6, 8, 9(ab), 11.
- **Chapter 6:** 6.3, 6.6, 6.7*.
- **Chapter 7:** 2, 7*, 8, 9*, 12, 14, 15, 16, 18, 20, 22*, 23, 27*, 30.
- **Chapter 8:** 1(bc), 5, 8d*, 10, 11, 15, 20*, 23, 31*, 38.
- **Chapter 9:** 2, 7, 11, 12, 13.

Exercises in *Book of Proof:*

You should do as many exercises as you think are helpful in Chapters 1 and 2. They're all pretty easy, and typically take only a minute or two to solve. You should turn in the following exercises:

- **Chapter 1:** Section 1.5: #10*; Section 1.8: #4*, 12*.
- **Chapter 2:** Section 2.5: #4*, 10*; Section 2.6: #12*; Section 2.9: #4*, 6*, 12*.

Math Camp Online, June 7 to July 23:

The video lectures are available on YouTube at the ArizonaMathCamp channel:

`https://www.youtube.com/channel/UCnm29LeklN7kcvHAZ0Fm42g`,

or just go to YouTube and search for ArizonaMathCamp. The lectures are organized into six sections, called "Playlists" on YouTube, which you can access by clicking on the Playlists link at the top of the home page, or by scrolling down on the home page:

Section 1: Foundations, Logic, and Proofs
Section 2: Euclidean Space
Section 3: Vector Spaces, Convexity, Concave Functions
Section 4: Real Analysis
Section 5: Foundations for Optimization
Section 6: Optimization

Most of the lectures are about an hour long, some a little longer, but I've divided them into parts A, B, etc. to keep the videos to around a half-hour or less in most cases.

Here's the schedule we'll follow:

Week 1 (June 7-11):	Sections 1 & 2 (Lectures 1-10)
Week 2 (June 14-18):	Section 3 (Lectures 11-17)
Week 3 (June 21-25):	Section 4 (Lectures 18-23)
Week 4 (June 28-July 2):	Section 5 (Lectures 24-29)
Week 5 (July 5-9):	Section 6 (Lectures 30-36)
Week 6 (July 12-16):	Section 6 (Lectures 37-40).

The total length of all the week's videos is longer in the first week (over 8 hours), and grows shorter each succeeding week as the material becomes somewhat more difficult and probably less familiar.

An exercise set will be due on Sunday night at the end of each week. Both Risheng and I will offer at least one live real-time video session each week in which you can ask questions, interacting with us and with the other students.

As I've indicated above, you can watch the videos and work on the exercises anytime, prior to June 7 if you wish.

The videos are also available in Dropbox, where the resolution is a bit better than on YouTube and where you may find it easier to download videos if you wish to save them to your computer. You will receive an email with instructions for accessing the videos in Dropbox.

Website and Lecture Notes:

There is a website for the course: `www.u.arizona.edu/∼mwalker/MathCamp2021.htm` . The website includes the exercises for the course, and also exams from prior years, with solutions. The website also includes lecture notes, as described in the next two paragraphs.

I've taught Math Camp in-person a number of times in the past, as well as a second math course for first-year students, called Econ 519. Lecture notes for those courses are available at `www.u.arizona.edu/∼mwalker/` . Those courses were not structured exactly like the current version of Math Camp, so the lecture notes don't correspond exactly to this course. But almost all the subjects in this course are treated in the lecture notes — it's sort of like the notes are a textbook but the course doesn't follow the textbook exactly. You might find these lecture notes helpful.

The lecture notes on the website for *this* course are simply some of the lecture notes from those earlier courses, ordered to correspond approximately to the organizational structure of this course.