

Math Camp

Department of Economics
Department of Agricultural and Resource Economics
Colorado State University
Fall, 2021

General Description

Math Camp is intended to support first-year graduate students in Economics, Agricultural and Resource Economics, and other related disciplines, in being ready to successfully complete ECON 501 (Quantitative Methods for Economists) and other mathematically oriented graduate courses. Math Camp is very strongly recommended for all entering students with the exception of individuals who have especially strong recent math training. Math Camp is required for all students funded by the Department of Economics and the Department of Agricultural and Resource Economics, CSU.

Despite uniform requirements of one semester of undergraduate calculus, which is usually limited to single variable calculus and associated optimization methods, many of you come to graduate school with a variety of math background experiences. It is for this reason that we hold this Math Camp, to get you thinking quantitatively and to ensure that you all have time to practice the mathematical skills needed to succeed in ECON 501 and the remainder of your graduate school experience.

Math Camp-2021 will be delivered *face-to-face* and in compliance with all CSU regulations during pandemic. The sessions will be held in indoor classrooms, that's why **masks are required for everyone by CSU regulation**. Attendance is required for **all** students. If you cannot attend some of the scheduled meetings, please kindly inform the instructor before the class.

Instructor

Ulmaskhon Kalandarova,
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Schedule

Tuesday, August 17, 1:00 – 4:00 pm USA Mountain Time, Clark Building - A102
Wednesday, August 18, 1:00 – 4:00 pm USA Mountain Time, Clark Building - A102
Friday, August 20, 8:00 – 11:00 am USA Mountain Time, Clark Building - A102

Texts

Simon, C.P. & L. Blume. 1994. Mathematics for Economists. (Norton), Chapters 1-6, Appendix A4.
Hill, R.C., Griffiths, W.E., & G.C. Lim. 2018. Principles of Econometrics. (John Wiley & Sons).

Additional Open-Access Resource for Statistics Review

Pishro-Nik, H. 2014. Introduction to Probability, Statistics, and Random Processes. (Kappa Research LLC), available at <https://www.probabilitycourse.com>.

Topic Outline

Part I - Foundations of Multivariate Calculus and Linear Algebra

1 MOTIVATION

- 1.1 Mathematics in Economic Theory
- 1.2 Mathematics and the Scalability of Models

2 ONE-VARIABLE CALCULUS: FOUNDATIONS

- 2.1 Functions on \mathbb{R}^1
- 2.2 Linear Functions
- 2.3 The Slope of Nonlinear Functions
- 2.4 Computing Derivatives
- 2.5 Differentiability and Continuity
- 2.6 Higher-Order Derivatives
- 2.7 Approximation by Differentials

3 ONE-VARIABLE CALCULUS: APPLICATIONS

- 3.1 Using the First Derivative for Graphing
- 3.2 Second Derivatives and Convexity
- 3.3 Rational Functions, Asymptotes, and Tails
- 3.4 Maxima and Minima
- 3.5 Applications to Economics

4 ONE-VARIABLE CALCULUS: CHAIN RULE

- 4.1 Composite Functions and the Chain Rule
- 4.2 Inverse Functions and their Derivatives 5

EXPONENTS AND LOGARITHMS

- 5.1 Exponential Functions
- 5.2 The Number e
- 5.3 Logarithms
- 5.4 Properties of Exponential and Logarithmic Functions
- 5.5 Derivatives of Exponential and Logarithmic Functions
- 5.6 Applications

6 INTRODUCTION TO LINEAR ALGEBRA

- 6.1 Linear Systems
- 6.2 Examples of Linear Models

7 INTEGRAL CALCULUS

- 7.1 Antiderivatives

7.2 Integration by Parts

7.3 The Fundamental Theorem of Calculus

7.4 Applications

Part II - Statistics Review (As/If time allows...)

1 RANDOM VARIABLES AND THEIR DISTRIBUTIONS

2 JOINT, MARGINAL, AND CONDITIONAL PROBABILITIES

3 MEASURES OF CENTRAL TENDENCY

4 REVIEW OF STATISTICAL INFERENCE

5 THE CENTRAL LIMIT THEOREM AND NORMAL DISTRIBUTION

6 HYPOTHESIS TESTING