



School of
Economics

Math Camp for Incoming PhD/MPhil (Econ) Students AY2021/22

This is a short graduate-student led course for incoming PhD/MPhil (Econ) students, covering some of the mathematics required for the first year program. Parts 1A and 1B are held prior to Term 1, and cover mathematical prerequisites for Microeconomics 1 and 2, and Econometrics 1. Parts 2A and 2B are held prior to Term 2, and cover material required for Macroeconomics 1 and 2, and Econometrics 2.

Math Camp is not compulsory, but recommended. Depending on your background you might be ok skipping parts of Parts 1A and 1B. However, Parts 2A and 2B are essential for Macro 1 and 2.

Part 1A (Linear Algebra, Probability Theory)

Instructor: TBC

- Session 1 Matrix algebra part I
- Session 2 Matrix algebra part II
- Session 3 Basics of probability theory
- Session 4 Univariate and multivariate distributions
- Session 5 Estimation strategies, and convergence concepts

Part 1B (Elementary Real Analysis, Optimization)

Instructor: TBC

- Session 1 Preliminaries and some important results in elementary real analysis (Intermediate Value Theorem, Implicit Function Theorem, Weierstrass' Extreme Value Theorem)
- Session 2 Separation Theorems and Unconstrained optimization
- Session 3 Constrained optimization with equality constraints (the Lagrange Multiplier method)
- Session 4 Constrained optimization with inequality constraints (the Kuhn-Tucker method)
- Session 5 Fixed Point Theorems

Part 2A (Dynamic Programming)

Instructor: TBC

- Session 1 Introductory macro examples, some mathematical preliminaries
- Session 2 Theory of Dynamic Programming under Certainty
- Session 3 Deterministic Dynamics and Stability
- Session 4 Stochastic dynamic programming
- Session 5 Search and Matching

Part 2B (Advanced Calculus)

Instructor: TBC

- Session 1 Difference Equations
- Session 2 Ordinary Differential Equations
- Session 3 Partial Differential Equations
- Session 4 Discrete and Continuous Time Stochastic Processes
- Session 5 Stochastic Calculus

Notes for Math Camp

Lecture notes and slides for last year's math camp can be found on the PhD (Econ) program description page <http://economics.smu.edu.sg/phd-economics/programme-description-idp>. These notes will be updated sometime in the summer.

Dates and venue

Part 1 will be held in early August

Part 2 will be held in late-December, early-January

A detailed (and confirmed) schedule of the math camp classes, and other pre-enrolment events, will be sent to you later in the summer.

Reference Textbooks

[1] Curtis, C. (2012), "Linear Algebra: An Introductory Approach", Springer Science & Business Media.

[2] Greene, W. (2012), "Econometric Analysis", 7th edition, Pearson. (Appendices A to D). Older editions are fine.

[3] Lucas, R. E. and N.L. Stokey (1989), "Recursive Methods in Economic Dynamics", Harvard.

[4] Magnus, J. R. and Neudecker, H. (2002), "Matrix Differential Calculus with Applications in Statistics and Econometrics", Wiley, Chichester.

[5] Ok, E. A. (2007), "Real Analysis with Economic Applications", Princeton University Press.

[6] Sydsaeter K., P. Hammond, A. Seierstad, and A. Strom (2005), "Further Mathematics for Economic Analysis", FT-Prentice Hall.

[7] Sundaram, R. (1996), "A First Course on Optimization Theory", Cambridge