

# Mathematics for Economist

Spring 2009  
Akihiko Matsui

## 1 General Information

Instructor: Professor Akihiko Matsui (Econ. Bldg. 1307)

Junior Advisers: Narita, Iijima

Spring Semester 2009: Mon. 13:10-14:50

Office Hours (Instructor): Tue. 13:00-15:00.

Lectures will be given in Japanese (subject to change).

No specific textbook will be used. See the following references:

- Sundaram, *A First Course in Optimization Theory*, Cambridge.
- Kolmogorov and Fomin, *Introductory Real Analysis*, Dover.
- Stokey and Lucas, *Recursive Methods in Economic Analysis*, Harvard.
- Avriel, *Nonlinear Programming*, Prentice-Hall.

Grades will be given based on midterm and final exams. There will be homework assignments, which may be counted toward credit in a marginal case.

## 2 Contents

1. Basic Topology in  $\mathbb{R}^n$ 
  - (a) Basic concepts (open sets, closed sets, compactness, convexity, functions, correspondences, continuity, convergence, etc)
  - (b) Existence of solutions: The Weierstrass theorem
  - (c) Fixed point theorem: The contraction mapping theorem, The Brouwer fixed point theorem

- (d) Parametric continuity: The theorem of maximum
- 2. Topology in metric spaces
  - (a) Definitions
  - (b) Completeness and Cauchy sequences
- 3. Optimization in  $\mathbb{R}^n$ 
  - (a) Constrained problems and the method of Lagrange
  - (b) Kuhn-Tucker conditions
  - (c) Constraint qualifications
- 4. Dynamic Programming
  - (a) Problems with bounded returns
  - (b) Problems with unbounded returns and transversality conditions