Mathematics II

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April 3, 2020

Outline

- Wednesday, Friday 10:25-12:10

    - April 3, 8, 10, 15, 17, 22, 24
    - May 1, 7 (Wed), 8, 13, 20, 22 (no class on 15)

- Course webpage:
  http://www.oyama.e.u-tokyo.ac.jp/mathii20/

- The aim of this course is to provide students with basic tools in Analysis that are needed in advanced level economics.

  Covers the main part of the Mathematical Appendix in Mas-Colell, Whinston, and Green (MWG).

Textbooks

- A. Mas-Colell, M.D. Whinston, and J.R. Green, *Microeconomic Theory*, Oxford University Press, 1995.

- G. Debreu, *Theory of Value*, Yale University Press, 1959.

  [Free download available]

- D. M. Kreps, *Microeconomic Foundations I: Choice and Competitive Markets*, Princeton University Press, 2012.

- D. Oyama and T. Takenawa, "On the (Non-)Differentiability of the Optimal Value Function When the Optimal Solution Is Unique," *Journal of Mathematical Economics* 76, 21-32, 2018.

- N.L. Stokey and R.E. Lucas, *Recursive Methods in Economic Dynamics*, Harvard University Press, 1989.

- M.L. Puterman, *Markov Decision Processes: Discrete Stochastic Dynamic Programming*, Wiley-Interscience, 2005.

Topics

1. Real numbers (Debreu 1.5)
2. Continuous functions and compact sets (MWG M.F; Debreu 1.6, 1.7)
3. Correspondences (MWG M.H; Debreu 1.8)
4. Convex sets and (quasi-)concave functions (MWG M.C; Debreu 1.9)
5. Differentiation (MWG M.A, M.B, M.E)
6. Negative (semi-)definite matrices (MWG M.D)
7. Separating hyperplane theorems (MWG M.G, M.M; Debreu 1.9)
8. Optimization (MWG M.J, M.K)
9. Envelope theorem (MWG M.L; Oyama and Takenawa)
10. Fixed point theorems (MWG M.I; Debreu 1.10)
11. Dynamic programming (MWG M.N; Stokey-Lucas 4; Puterman 5, 6)

Other Information

- Taught with slides.

- Grading:
  Final exam

  (Homeworks do not directly count.)

- Homework:
  Submit your homework through ITC-LMS.