

**ECON 751: Mathematical Methods in Economics, fall 2010**  
**MW 2:30-3:45, Thompson 919**

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This course develops mathematical tools that are useful for the analysis of political economic systems. The textbook is M. Pemberton and N. Rau, *Mathematics for Economists* (Manchester University Press, 2<sup>nd</sup> edition, 2006). The book, which is available from *Food for Thought Books* in Amherst, may be supplemented by a few outside readings that I'll hand out in class.

Evaluation will be based on a series of weekly problem sets, a midterm exam, and a comprehensive final, with respective grading weights of 17%, 33%, and 50%. No incompletes will be given for the course except for documented medical or other emergencies.

The following topics will be covered:

**1. Basic concepts and differential calculus (1-2 weeks)**

Most of this material should be well known from undergraduate classes, especially chapters 1-8. These chapters have also been covered in the August math review.

- a. Introduction and overview
- b. Equations, inequalities, sets, functions, sequences and series (chapters 1-5)
- c. Definition and methods of differentiation (chapters 6-7)
- d. Maxima and minima (chapter 8).
- e. Exponential and logarithmic functions (chapter 9)
- f. Approximations and Taylor series (chapter 10)

**2. Linear algebra (2-3 weeks)**

- a. Vectors and matrices (chapter 11)
- b. Systems of equations (chapter 12)
- c. Determinants (chapter 13)

**3. Functions of several variables (2 weeks)**

- a. Partial derivatives and the chain rule (chapter 14)
- b. Implicit relations (chapter 15)

**4. Optimization (2-3 weeks)**

- a. Unconstrained optimization (chapter 16)
- b. Constrained optimization (chapters 17-18)

**5. Integration and Dynamic Analysis (3-4 weeks)**

- a. Integral calculus (chapters 19-20)
- b. Differential and difference equations (chapters 21-26)

**6. Dynamic optimization and optimal control theory (1 week)**

- a. Discrete time (chapter 27)
- b. Optimal control (chapter 28)