

**Queen's University
Department of Economics**

MA Methods Review

Fall 2011

1. Instructor

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2. Format

This course is intended to review some of the mathematics and statistics used in graduate economics courses. Since this is a short course, coverage of the topics will not be mathematically in-depth in the sense of elaborate proofs etc.; it is meant to introduce/brush-up some of the technical tools commonly used in graduate-level economic analysis.

At the outset we will conduct an evaluation of the basic math skills of all incoming students. For those who pass this evaluation, attendance in the course will be optional.

Exercises will be assigned on some topics. Submission of assignments is not required but is aimed at providing you with practice at problem solving.

On the last day of class, there will be a short exit exam with a grading of pass/fail.

3. Schedule

Fall 2011				
Monday	Tuesday	Wednesday	Thursday	Friday
Aug. 29	Aug. 30	Aug. 31	1	2 10:00-12:00 2:00-5:00 DUN 213 Introduction and Written Evaluation
5	6 2:00-5:00 DUN 213	7 10:00-12:00 2:00-5:00 DUN 213	8 10:00-12:00 2:00-5:00 DUN 213	9 Exit Exam 10:00-12:00 DUN 213

Note: There will be two additional lectures in the winter term to be scheduled.

4. Topics

(a) General

- Notation (e.g. Summation, Quantifiers)
- Logic (e.g. Necessary and Sufficient Conditions., if and only if, Proof by contradiction, Induction)
- Naive Set Theory

(b) Point-Set Topology

- Metric Spaces
- Closed and Open sets
- Limits and Continuity

(c) Linear Algebra

- Vectors, scalar and vector products
- Matrices (multiplication, transpose, rank, basis, inverse, determinant)
- Quadratic Forms

(d) Calculus

- Functions: Monotonicity, Convexity
- Differentiation: Single-variable, Multi-variable (partial and total), Envelope thm.
- Second and Higher-order derivatives (Hessian matrix)
- Approximations (Taylor series)
- Differential equations (very basic coverage)
- Integration

(e) Probability Theory and Statistics

- Random Variables, Distribution and Moments
- Bayes rule, Conditional and Unconditional calculations
- Point and Interval Estimation (basics)
- Stochastic Processes (very basic coverage)

(f) Optimization

- Unconstrained (with concavity/convexity)
- Constrained (Lagrange multiplier method)
- Dynamic Programming (very basic coverage)

(g) Ordinary Differential Equations

- Solution methods and application to economic growth

(h) **Suggested References**

- i. *Mathematics for Economic Analysis* by Knut Sydsaeter and Peter J. Hammond.
- ii. *Foundations of Mathematical Economics* by Michael Carter (MIT Press)
- iii. *Fundamental Methods of Mathematical Economics* by Alpha C. Chiang (McGraw-Hill),
- iv. *Optimization in Economic Theory* by Avinash Dixit
- v. *Mathematical Statistics* by Keith Knight
- vi. “**Immediately Useful Mathematics**” by John Leach (McMaster)
- vii. “**Review of Mathematics for Economics**” by Marc-Andre Letendre (McMaster)