Mathematics for Graduate Students in Economics
Preliminary Course Outline (Fall 2016)

Instructor: Thomas Parker

Lecture Time/Location: Location TBA. August 29-September 2 and September 5-September 7, 10am-12pm and 1-3pm, then September 8, 6:30-9:30pm, September 9, 3-5pm and September 10, 10am-12pm.

Tutorials: (Location is same place as lectures) 3-4pm on August 29-September 2 and September 5-7.

Tutorial Instructor: TBA

Email: tmparker@uwaterloo.ca

Office/Office Hours: HH 206, 4-5pm after tutorials

Phone: 519-888-4567 x 38600

Course Objective: This course is designed to review the basic mathematical background that incoming masters and doctoral students will need for their core economics and econometrics courses. Most topics should be a review but if they are not, they should be an introduction to the basic tools that will be used in theory classes that begin in the fall term.

Suggested Reading: There is no recommended text; however, if you would like to review some material before you start the course (the pace will be quick), the course will resemble material contained in the following list of sources.

- Osborne, M., Mathematical methods for economic theory: a tutorial
- Simon, C.P. and L. Blume, Mathematics for Economists
- Mas-Colell, A., M.D. Whinston and J.R. Green, Microeconomic Theory (Mathematical Appendix)
- Dixit, A., Optimization in Economic Theory (chapters 2 and 3)
- Greene, W.H., Econometric Analysis (Appendices A and B)
- Casella, G. and R.L. Berger, Statistical Inference (Chapters 1 and 2)

Schedule: We should cover the following topics.

1. Mathematical Basics: Sets, functions, logic and methods of proof
2. Linear algebra: Definitions of vectors and matrices, properties such as determinants, eigenvalues and positive and negative definiteness
3. Topics in multivariate calculus: A review of differentiation rules, Taylor expansions, implicit differentiation and integration
4. Convexity: Convex sets, concave and convex functions, quasiconcavity and quasiconvexity of functions
5. Optimization: Unconstrained optimization, constrained optimization, convexity and the envelope theorem
6. Probability theory: Probability spaces, various characterizations of random variables, conditioning, the multivariate normal distribution

Evaluation: There will be daily assignments which are meant to reinforce the lecture material and give you practice for the exams. Assignments (and all other relevant material) will be available on the course website, http://arts.uwaterloo.ca/~tmparker/teaching/math_econ/math_econ.html. There are two exams — on September 2, 3-5pm and September 10, 10am-12pm. The course will be graded on a pass/fail basis.

Other administrative details

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See https://uwaterloo.ca/academic-integrity/ and https://uwaterloo.ca/academic-integrity/sites/ca.academic-integrity/files/uploads/files/FinalFact_0.pdf for more information. You are encouraged to discuss homework and course material with other students in class. However, you are responsible for submitting your own work. If I determine that any assignment was not written solely by the student whose name appears on the work, that student will receive a zero for the grade in question and may receive a failing grade for the class.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71). For typical penalties check Guidelines for the Assessment of Penalties (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/guidelines/guidelines-assessment-penalties).

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4 (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) and the Faculty of Arts' grievance processes information (https://uwaterloo.ca/arts/current-undergraduates/student-support/student-grievances-faculty-arts-processes). When in doubt please be certain to contact the department's administrative assistant, who will provide further assistance.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72).

Note for Students with Disabilities: The AccessAbility Services (AS) Office (http://uwaterloo.ca/disability-services/), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AS at the beginning of each academic term.