SINGAPORE MANAGEMENT UNIVERSITY
SCHOOL OF ECONOMICS

ECON205 Intermediate Mathematics for Economics
2015-2016 Term 2

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Consultation hours: TBA  Venue: TBA

Course Overview  This course covers basic matrix algebra, univariate and multivariate calculus, with emphasis on optimization theory. The objective is to provide economics students with the fundamental mathematical skills required for undergraduate economics and econometrics. The course assumes familiarity with basic functions, and derivatives of functions of one variable, and elementary integration.

Time and Venue  Monday 1200-1515  Venue SOE Seminar Room 3.7

Assessment & Evaluation
Assignments  40%
Final examination  40%
Class participation  20%

Required Text
Class notes from instructor. Updated versions will be available on the ECON205 coursepage [www.mysmu.edu/faculty/anthonytay/ec205.htm

Supplementary References
(about the same level)

(more advanced)

The fine print:

Academic Integrity  All acts of academic dishonesty (including, but not limited to, plagiarism, cheating, fabrication, facilitation of acts of academic dishonesty by others, unauthorized possession of exam questions, or tampering with the academic work of other students) are serious offences. All work (whether oral or written) submitted for purposes of assessment must be the student’s own work. Penalties for violation of the policy range from zero marks for the component assessment to expulsion, depending on the nature of the offense. When in doubt, students should consult the instructors of the course. Details on the SMU Code of Academic Integrity may be accessed at [http://www.smu.edu/resources.html.

Accessibility  SMU strives to make learning experiences accessible for all. If students anticipate or experience physical or academic barriers due to disability, please let the instructor know immediately. Students are also welcome to contact the university's disability services team if they have questions or concerns about academic provisions: inclusion@smu.edu.sg. Please be aware that the accessible tables in the seminar room should remain available for students who require them.

SYLLABUS, SCHEDULE and READINGS
Matrix algebra (the topics marked ‘*’*) is covered through assigned readings and exercises, with consultations available for those who need it. Although this material is left for self-study, and will not be covered during class time, it is not optional! Matrix algebra is examinable. **Matrix algebra is examinable.**

**Pre-course reading**

The following readings contain math that you are assumed to know already (some of it since primary school). Please review on your own if necessary:

*SH Chapters 1, 2, 4, 5.*

In addition, the following chapters will be extremely useful for you to read. Although you will not be tested explicitly on these topics, we will certainly use them, as they form the very basic grammar and vocabulary of mathematics:

- Some aspects of proofs  
  *SH Chapters 3.4, 3.5, 3.7*
- Very elementary set theory  
  *SH Chapters 3.6*

**Week 1**

Mathematical economic models: an introduction to the course

*Notes §1*

Sequences and series, limits at infinity

*Notes §6, SH 7.11*

For self-study (not covered in class, but is not optional, i.e., these topics are examinable)

- Functions  
  *Notes §5*
- *Summation notation  
  Notes (MA) §3, SH Chapters 3.1 to 3.3, SH 10.1 to 10.7*
- *Solving systems of linear equations  
  Notes (MA) §2, SH 15.1, 15.6*

**Week 2**

Limits of functions

*Notes §7, SH 6.1, 7.8, 7.9*

Derivatives

*Notes §8, SH 6.1 to 6.8, 6.10, 6.11*

For self-study

- *Matrix algebra: basic definitions:  
  Notes (MA) §4, SH Chapter 15.2*

**Week 3**

Concavity and convexity

*Notes §10, SH 6.9*

Single-variable optimization

*Notes §11, SH Chapter 8*

For self-study

- Linear approximations  
  Notes §10, SH 7.4 to 7.7, 7.10
- Elasticities  
  Notes §9, SH 7.7
- L’Hopital’s rules  
  Notes §13, SH 7.12
- * Matrix algebra: multiplication, zero and identity matrices  
  Notes (MA) §5, SH 15.3 to 15.4*
Week 4
Implicit differentiation
Notes §14, SH 7.1 to 7.3

For self-study
*Matrix algebra: inverses Notes (MA) §6, SH 16.6
*Matrix algebra - finding inverses with elem. row operations Notes (MA) §7, SH 16.7, 16.8

Week 5
Differential equations
Notes §16, SH 9.8, 9.9

For self-study
Integration Notes §15, SH 9.1 to 9.7 (pay special attention to 9.7)
*Matrix algebra: determinants and Cramer’s rule Notes (MA) §8, SH 16.1 to 16.5, 16.8

Week 6
Functions of many variables,
Notes §17, SH 11.1 to 11.5
Partial derivatives
Notes §18, SH 11.6 to 11.8

For self-study
*Matrix algebra: Laplace expansions Notes (MA) §9, SH 16.1 to 16.5, 16.8

Week 7
Multivariable chain rules, and implicit differentiation revisited
Notes §19, SH 12.1 to 12.7, 12.10, 12.11

For self-study
*Matrix algebra: properties of determinants Notes (MA) §10, SH 16.1 to 16.5, 16.8

Week 8
Recess

Week 9
Multivariate linear approx. and differentials
Notes §20, SH 12.8, 12.9

For self-study
*Matrix algebra: a general formula for inverses Notes (MA) §12, SH 16.7

Week 10
Multivariable optimization
Notes §21, SH 13.1 to 13.5

Week 11
Comparative statics: the envelope theorem
Notes §21, SH 13.6, 13.7

Week 12
Multivariable optimization with equality constraints
SH 14.1 to 14.7

Week 13
Multivariable optimization with inequality constraints
SH 14.8 to 14.10
Class participation (20%)
Points are given for positive contributions toward the learning experience of the class, including asking questions in class, answering fellow students’ questions, pointing typos in the notes. Suspected typos (typing errors) and thinkos (thinking errors) that you find in my notes should be posted on the “Typos and Other Errors” Forum on the eLearn Coursepage. You are encouraged to post questions about topics covered in the course under the ‘Discussions’ forum, and to answer other students’ questions.

We will also do some exercises during class time. When I want someone to come to the board to solve a problem, I will ask for volunteers. Volunteers will get class participation points (even if their answers are wrong, as long as there was a ‘genuine attempt; it seems to me that we learn more trying to figure out why an answer is wrong, than by seeing a right answer the first time around). At the end of the course, the class participation points will be scaled to out of ten. In general you will not be given any time to try the question before coming to the board. You will, however, be given promptings from myself, and your classmates. You will also have to explain your answer to the class (preferably interactively, while doing the question, rather than after writing out the answers first).

Assignments (40%)
I am moving away from traditional assignments. Instead, I am trying a new system with the following objectives in mind:

1. to encourage all of you to start practicing early;
2. to encourage discussion;
3. to give you access to proposed answers to the exercises.

This is how it works: on the eLearn coursepage, you will find (under Collaborate > Discussions) a forum titled “My Journal”, with your names in it.

a. **Do the exercises in my notes, and post your answers under your name.** Post by section, i.e., post answers to exercises in a section in a single main post. I suggest that you write the answers by hand, then scan to a pdf file and post. Please use a dark ink / pencil for your work. Your answers for each section should go up within three weeks after its appearance in the class schedule (regardless of whether the class itself is on schedule). Exact dates will be provided.

b. After posting, you may ‘add’ on additional answers or corrections, by replying to that thread. In your post, you may want to highlight areas where you are having difficulties.

c. Check out other students answers and make constructive comments, such as offering alternative methods for solving the problem; pointing out errors; and so on.

You will be given points for posts and constructive comments. Trivial alternatives to solutions are discouraged. Trivial comments (such as “v.good!”, “nice handwriting!”) will be frowned upon; uncivil comments will be frowned upon twice, and may result in deduction of points.

Your journal and the discussions therein will be administered and monitored closely by the TA, who may also make remarks and alert me to questions that I should look more closely into. However, ‘final answers’ will not be posted.

There are 19 sections in the ‘IMFE’ part and 10 sections in the ‘MA’ that have been assigned to you. You will get one point for a reasonable attempt at the exercises each section, meaning that you make a serious attempt in solving at least half of the question there. This gives 29 points. The remaining 11 points will be awarded for particularly good and complete answers to each of sections IMFE 14, 17, 18, 19, 20, 21, 22, and MA 2, 8, 9, and 10.

Exam (40%)
The final exam is a two-hour closed-book examination. You will not be allowed to bring your calculators into the examination hall. Calculators are not allowed in the examination!