Math Camp August 2018

Course Objective

The primary objective of this course is to provide incoming graduate students with the mathematical foundations necessary for the first year sequence of theory and econometric courses. This course is designed on the presumption that students will have already been exposed to the majority of this material in previous studies. Thus the scope of the material to be covered is much larger than one would encounter in an ordinary mathematics course.

Who Should Take this Course?

Every incoming PhD student is required to take this course as part of our PhD program. All PhD students will take an exit test following Math Camp (27 August 2018) to determine mastery of these concepts. A successful grade on the Math Camp exit test means you will not be required to take Math for Economists I. Doctoral students who do not pass the Math Camp exit test will be required to take Math for Economists I. Incoming MA students are encouraged to take this course. There are two main benefits. The first is it will help you complete work in your first year courses particularly those in the fall semester. The second benefit for enrolled MA students is that if they elect to take the Math Camp exit test and pass it, the requirement of Math for Economists I will be waived.

General Information:

Instructors: TBD
Dates: August 7 (Tues) - 28, 2018, Monday to Thursday nights only (no Friday classes)
Time: 5 - 8 pm plus 1 hour after class (starting at 8pm) for advanced material.
Location: Dealy Hall, 5th floor conference room

Text Books

A.C. Chiang and K. Wainwright, Fundamental Methods of Mathematical Economics, 4th edition, McGraw Hill. (current Math I text)
D. Salvatore and D. Reagle, Schaum's Outlines, Statistics and Econometrics, 2nd Edition

Other Useful Books

E. Dowling, Schaum's Outlines, Introduction to Mathematical Economics (recommended in Math I and Math II)

Additional texts for supplemental instruction

Note the acronym's (e.g., OB, FMEA are used within the syllabus)

OB: "Linear Algebra with Applications" by Otto Bretscher, Pearson (2009). This is a very basic undergraduate Linear Algebra text book used in many American undergraduate programs.

FMEA: "Further Mathematics for Economic Analysis" by Knut Sydaester, Peter Hammond, Alte

Seirstad and Arne Strom, Prentice Hall (2008).

JS: "Calculus: Early Transcendentals" by James Stewart, Thomson Learning Inc (2008). This is a standard Calculus sequence book.

WR: "Principles of Mathematical Analysis" by Walter Rudin, Mcgraw Hill (1976). A standard Undergraduate Real Analysis Text.

MGB: "Principles of Statistics" by M.G. Bulmer, Dover Publication(1979). This is a basic, non-mathematical text book on statistics, well-written and easy to understand.

HMC: "Introduction to Mathematical Statistics" by V. Hogg, Robert, Joseph W. McKean & Allen T. Craig, Pearson Education Inc. (2013). This book is slighlty more mathematical in its treatment of the relevant topics in Statistics.

Course Outline

Note: Titles in RED are specifically for PhD students and are expected to be covered from 8:00 pm - 9:00 pm on days mentioned.

1 Week 1

7-Aug Tuesday

Algebra of sets and mapping. Types of function, Limit (existence and uniqueness), Continuity and differentiability of a function, Rules of differentiation, Partial differntiation.

Homework CW: 2.3-2.4, 6.2- 6.4, 6.7, 7.1 - 7.4.

Additional Texts used FMEA: Appendix A1, JS: Ch-2, 3.2, 3.4 & 14.3.

8-Aug Wednesday

Jacobian matrices, Total differential, Rules of differentials, Total derivatives, Derivatives of implicit functions, Higher order derivatives. Directional derivatives and gradients, The mean value theorem, Boundedness, Metric spaces, Open and closed sets

Homework CW: 7.6, 8.1 - 8.5 Additional Texts used FMEA: 2.1, 13.1 WR: 1.5 - 1.11, 2.15 - 2.21

9-Aug Thursday

Exponential and Logarithmic functions, Concave and convex functions, Relative vs absolute extremum, Area under the curve and definite integral, Fundamental Theorem of Calculus. Compactness, Connectedness, Convex sets, Quasiconcave and Quasiconvex functions*, Hessian Matrices

Homework CW: 10.1 - 10.5, 9.2-9.4

Additional Texts used CW: 11.2 & 11.5, JS: Ch-5, WR: 2.31, 2.32, 2.45-2.47

2 Week 2

13-Aug Monday
Rules of integration, Techniques of integration, Improper integral, Leibniz's Formula.
Homework CW: 14.2 - 14.4
Additional Texts used FMEA: 4.1, 4.2, JS: Ch-5, 7.1 & 7.8

14-Aug Tuesday
Euclidean space, Vector spaces and vector operations, System of linear equations, Reduced Echelon Form (REF) and Rank of a matrix, Special matrices.
Homework CW: 4.1 - 4.3, Handout of extra practice questions.
Additional Texts used OB: Ch-1 & Appendix A.

15-Aug Wednesday
Matrix algebra, Matrix multiplication, , Spanning, bases and Linear independence, Fundamental Theorem of Linear Algebra (Rank-Nullity Theorem). Linear Transformation and its inverse, Image and Kernel, Dimensions of subspaces of R^n
HomeworkCW: 4.4 - 4.6, Handout of extra practice questions.
Additional Texts used OB: Ch-2 & 3.

16-Aug Thursday
Matrix inverse, Orthogonality, Orthogonal projection, Pythagorean Theorem, Cauchy inequality and Correlation coefficient, Determinant of a Matrix (Algebraic and geometric interpretation), Properties of determinants, Cramers' rule. Least Squares and Data Fitting
Homework CW: 5.1 - 5.5
Additional Texts used OB: Ch-5 & 6

3 Week 3

20-Aug Monday
Eigen values and Eigen vectors, Diagonalization, Qudratic form and definiteness. Characterization of Invertible matrices.
Homework Handout of practice questions.
Additional Texts used OB: Ch-7 & 8.2

21-Aug Tuesday
Probability (Frequentist Approach), Discrete and continuous random variables and their Probability distributions (Univariate and Multivariate), Measures of central tendency, Measures of dispersion.

Homework SR: 2.1 - 2.4, 3.1 & 3.2
Additional Texts used MGB: Ch- 1, 2, 3 & 4. HMC: 1.5 - 1.7, 2.1.

22-Aug Wednesday
Taylors' approximation, Expected values & Moment Generating Functions (MGF), Binomial, Poisson and exponential distributions, Normal distribution and standard normal variates.
Homework SR: 3.3 -3.5
Additional Texts used MGB: Ch- 5, 6, & 7. HMC: 3.1, 3.2, 3.4, CW: 9.5, FMEA: 2.6

23-Aug Thursday
Sampling, Sampling distribution of mean & Central Limit Theorem (CLT), Chi Square, t and F distributions, Tests of Significance.
Homework SR: 4.1- 4.4
Additional Texts used MGB: Ch- 7, 8& 9. HMC: 3.6, 4.1, 5.2.3 & 5.3

4 Week 4

27-Aug Monday
Confidence Intervals and Hypothesis Testing OR Review.
Homework SR: 5.1 - 5.5
Additional Texts used MGB: Ch- 10 & 11. HMC: 4.2, 4.3, 4.5

28-Aug Tuesday
FINAL EXAM