Math: From An Economist's Perspective

For Personal Reference, happy to circulate

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Check the Github Page for this project, or email me!

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HERE WE GO!

Math is fascinating, certainly. It is clean, organized, beautiful, philosophical, but it is also hard to grasp. I started this project for one simple purpose: As an Economic Ph.D. student, math was not my strongest suit and I NEED to change that. Hence, this math-learning notebook will be tailored according to the need of an economist, instead of being, you know, math math.

Here, I cover the math knowledge ranging from basic concepts, to fundamental theories including linear algebra and real analysis, and more integrated topics including optimization, dynamic methods stochastic control, etc. There are several valuable sources I referred to in the process of making this notebook:

First, I thank Prof. Brijesh Pinto at USC Economics for reminding the importance of math and the pleasure of playing with math in the math camp prior to my Ph.D. study. Though brief and abstract, the math camp had actually inspired me to go back to the beginning, really dive in and put together this personal learning notes.

This notebook has two general aspects: math theories and their application in economic research. I organize the theoretical contents based on Hoy et al. (2011)'s *Mathematics of Economics*, Carter (2001)'s *Fundations of Mathematical Economics* and Eichhorn and Gleißner (2016)'s *Mathematics and Methodology for Economics*; Vali (2014)'s *Principles of Mathematical Economics* and De la Fuente (2000)'s *Mathematical Methods and Models for Economists* are my main references for the application of math thoeries in specific economic questions.

Since this notebook approaches math in an application perspective, I will not only review the theoretical aspects of each topic, but include modelling simulation techniques and their application All the codes related to this review can be found on my Github page.

I thank Dr. Svetlana Bryzgalova for her valuable intuitions and impressive knowledge of the empirical finance literature. Building this review is truly a memorable journey for me. I would love to share this review and all the related materials to anyone that finds them useful. And unavoidably, I would make some typos and other minor mistakes (hopefully not big ones). So I'd really appreciate any correction. If you find any mistakes, please either set up a branch on Github or send the mistakes to this

email address saizhang.econ@gmail.com, BIG thanks in advance!

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LINEAR ALGEBRA

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CHAPTER 2

REAL ANALYSIS

CHAPTER 3

OPTIMIZATION

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DYNAMIC METHOD

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