Lecture for Step2 and Step3 Preparation

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Starting Date: TBD	Class Size: approximately 10 students (4 remaining).
Office Hours: By appointment only	Class Hours: T/Th 4-5pm
Office: 102	Class Room: 110
Test Date: June 9th for STEP 2	Test Date: June 20th for STEP 3

Course Description and Objective

About the Sixth Term Examination Paper (STEP) STEP (Sixth Term Examination Paper) Mathematics is a well-established mathematics examination designed to test candidates on questions that are similar in style to undergraduate mathematics.

STEP is used by the University of Cambridge, the University of Warwick and Imperial College London. Please check the details of your course(s) to confirm if you are required to take STEP as part of the application process. If you are in any doubt, please contact the university directly.

Other universities sometimes ask candidates to take STEP as part of their offer – in such cases, the university can advise on which papers to take.

There are also a number of candidates who sit STEP papers as a challenge. (Quoted from the STEP official website).

This seminar aims to help top students get an 'outstanding' mark and self-motivated students a 'very good' mark for their STEP 2 and STEP 3 exams, which would somehow offer you an interview at least when you apply the mathematics-related majors of your UK dream school.

Required Materials

- 'Step mathematics specifications for June 2020 Examinations' is available at Step 2022
- Lectures notes available during class (All right reserved and not for distribution).
- Past papers available at Past Papers

Prerequisites (Some are STEP3 only)

All will be smooth of the question cracking if you are familiar with the following topics and methods. Certainly, we may have some review before involving every topic of coverage of the STEP exam.

- For pure mathematics part:
  - Understand and apply the method of proving by induction or contradiction.
  - Be familiar and fluent with rules of differentiation and integration: chain rule, integration by substitution/parts, trigonometric substitution for integration, and etc.
  - Coordinate/elliptical geometry in 2D Euclidean space or Complex plane.
  - Vieta's law, long division, intermediate value theorem.
  - Binomial expansion, partial fraction technique, method of difference, Maclaurin expansion.
  - the definition of various asymptotes, curve sketching in Cartesian/Polar coordinates.
  - Bisecting method, or Newton's iteration of finding zeros of function.
  - vectors in 3D space, dot product and cross/vector product and their applications.
  - matrix multiplication, discriminant, find inverse matrix, eigenvalue/eigenvectors of matrices.
  - integrating factor method for 1st order ordinary differential equations, 2nd order linear ODEs.
  - ,and etc.
- For Mechanics:
  - Newton's laws, moments, friction.
  - Conservation law of energy, momentum, and angular momentum.
  - Hooke's law.
  - Find center of mass by integration.
  - ,and etc.
- For Probability/Statistics Part:
  - Rules of probability/measure space, Bayesian rule.
  - Expectation, variance, PDF, CDF, and etc of continuous random variables .
  - Poisson distribution. Approximate Binomial distribution with Poisson or normal distribution.
  - Sampling distribution, P-value, one-sample/two-samples t-testing.
  - ,and etc.