THE CHINESE UNIVERSITY OF HONG KONG

Department of Mathematics

MATH3060 (Fall 2019)

Mathematical Analysis III

Lectures: W2 at LT4; F2,3 at C2, Tutorial W?? at ??, Lady Shaw Building
Course Web Page : `http://www.math.cuhk.edu.hk/course/math3060/`

Backgroud

In our mathematics program, MATH1010, 1050, 2010, 2020, 2050, 2060 and 3060 provides a good foundation on analysis. After completing these courses, you are well-equipped for advanced courses. In particular, according to interest, you could choose among topology, real analysis, functional analysis, and Fourier analysis, etc.

Outline

There are three topics in this course–Fourier series, metric spaces, and the space of continuous functions divided into three chapters.

Every math major should have learnt some Fourier series when they graduate! Indeed, this topic is supposed to be covered in 2060. It has been postponed until now due to lack of time. Those who are interested in this subject will learn more from MATH3093 Fourier Analysis.

Metric space constitutes a special but important class of topological spaces. It aims to prepare the class for point set topology MATH3070. The contraction mapping principle on complete metric spaces enables us to provide proofs for two fundamental theorems, namely the implicit function theorem and the fundamental existence theorem for the Cauchy problem of differential equations. They were stated without proof in MATH2010 and MATH3270 respectively.

The space of continuous functions is perhaps the simplest infinite dimensional normed space (a special metric space). Two fundamental theorems, namely, the Arzela-Ascoli theorem and the Baire category theorem, will be discussed together with some applications. We will discuss the general properties of normed spaces and linear operators fully in MATH4010 Functional Analysis. We hope to stimulate your interest in functional analysis through a case study on the space of continuous functions.

A thorough study on my lecture notes will be sufficient for this course. Materials for optional readings are for those who want to learn more. It is not intended for examination. Further references are suggested as we proceed, and they are for optional readings too.

Once again I would like to point out we not only need to READ mathematics, we need to DO mathematics. Try to go through as many exercises as you can. Don't just wait for the model answers.

Instructor

- Prof Kai-Seng Chou
- Contact information:
  - Office: Rm 223 LSB

  - Phone: 3943 7971
  - Email: kschou@math.cuhk.edu.hk
  - Office hours: By appointment.

Teaching Assistants

- Mr. Yan-Lung Li
  - Office: Rm 505 AB1
  - Phone: 3943 4298
  - Email: ylli@math.cuhk.edu.hk
  - Office hours: Tuesday, Wednesday, Thursday: 2:00 p.m. - 5:00 p.m.

References

- *Fourier Analysis–An Introduction*, E.M. Stein and R. Shakarchi, Princeton Lectures in Analysis, Princeton 2002.
- *Metric Spaces*, E.T. Copson, Cambridge U Press, 1968.
- *Advanced Calculus*, 2nd ed., P.M. Fitzpatrick, Thomson Brooks/Cole, 2006.

Grade

- 15% Assignments
- 40% Midterm Examination
- 45% Final Examination