

Applied Mathematics and Computational Science Qualifying Exam Guidelines
Department of Mathematics and Computer Science, Chulalongkorn University

SUBJECT: Applied Analysis

1. Differential and integral Calculus

- Differentiability in one and several variables
- The chain rule
- Vector-valued functions and their derivatives
- Integration on the line and in higher dimension
- Multiple integrals and iterated integrals
- Change of variables for multiple integrals

2. Line and surface integrals

- Arc length, line integrals and Green's theorem
- Surface integrals and divergence theorem
- Stokes' theorem

3. Normed spaces and Banach spaces

- Vector spaces and normed spaces
- Sequences and Cauchy sequences
- Continuous functions
- Bounded linear operators
- Metric spaces and complete metric spaces
- Contraction mapping principle
- Banach spaces
- Applications to ODE, Picard's iteration and dynamical system

4. Hilbert spaces

- Inner product spaces and Hilbert spaces
- Orthonormal basis
- Adjoint operators
- Fourier series
- Eigenfunction expansion

เอกสารอ้างอิง

1. Wilfred Kaplan, *Advanced Calculus*, 5th ed., Addison Wesley, 2003.
2. Gerald B. Folland, *Advanced Calculus*, Prentice Hall, 2002.
3. Erwin Kreyszig, *Introductory Functional Analysis with Applications*, John Wiley & Sons, 1978.
4. Béla Bollobás, *Linear Analysis, An Introductory Course*, Cambridge University Press, 1999.
5. Robert G. Bartle and Donald R. Sherbert, *Introduction to Real Analysis*, 3rd edition, John-Wiley&Sons, Inc., 2000.

