

Introduction to Complex Variables

Math 300 Section 202 - Spring 2015

- **Instructor:** *Malabika Pramanik*
 - **Office:** *Mathematics Building, Room 214*
 - **Phone:** *(604)822-2855*
 - **Email:** *malabika@math.ubc.ca*
 - **Lecture hours:** *Monday, Wednesday, Friday, 1-2pm in LSK 460.*
 - **Office hours:** *To be announced.*
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- **Course webpage :** The course website is

<http://www.math.ubc.ca/~malabika/teaching/ubc/spring15/math300/index.html>
- Homework assignments and all relevant course information (such as changes to office hours if any, or solutions to homework problems if needed) will be posted here.
- **Text :** *Fundamentals of Complex Analysis with Applications* by Saff and Snider.
 - **Pre-requisite:** One of Math 200, Math 217, Math 226, Math 253, Math 263.
 - **Co-requisite:** One of Math 217, Math 227, Math 263, Math 317.
 - **Course outline :** The core topics of this course, listed as follows in the UBC course description, are contained in Chapters 1-6 of the textbook.
 - Functions of a complex variable,
 - Cauchy-Riemann equations,
 - Elementary functions,
 - Cauchy's theorem and contour integration,
 - Laurent series
 - Poles and residues.

• **Grade components :** Weekly homework problems will be posted on the course website. In addition, there will be two midterms and a final exam. Your total score will be a weighted average of the scores you receive in homework, midterms and the final, with the breakdown as follows.

Homework	10%
Midterm 1	20%
Midterm 2	20%
Final exam	50%

• **Exam dates :**

- Midterm 1 will be on **Wednesday February 11** in the classroom.
- Midterm 2 will be on **Monday March 16** in the classroom.
- The final exam date is currently unavailable, but will be released during the term.
Do not make end-of-term travel plans until this date has been fixed.

• **Course Policies :** Late homework assignments will not be accepted. The worst two homework assignment grades will be dropped.

Missing a midterm normally results in a mark of 0. Exceptions may be granted in two cases: prior consent of the instructor or a medical emergency. In the latter case, the instructor must be notified within 48 hours of the missed test, and presented with a doctor's note immediately upon the student's return to UBC. Failure to comply results in a 0 mark.

If a midterm was missed for legitimate reasons, the weight of the missed midterm will be transferred to the final. Make-up midterms will, in general, not be provided.

In any circumstance, the grade will not be based on the homework and the final alone! There has to be at least one midterm grade.

Approximate lecture schedule

Part I. Complex numbers and analytic functions

(11 lectures and 3 homework assignments)

- §1.1 The algebra of complex numbers
- §1.2 Point representation of complex numbers
- §1.3 Vectors and polar forms
- §1.4 The complex exponential
- §1.5 Powers and roots
- §1.6 Planar sets
- §1.7 The Riemann sphere
- §2.1 Functions of a complex variable
- §2.2 Limits and continuity
- §2.3 Analyticity
- §2.4 The Cauchy-Riemann equations
- §2.5 Harmonic functions

Part II. Elementary functions and complex integration

(13 lectures and 4 homework assignments)

- §3.1 Polynomials and rational functions
- §3.2 Exponential, trigonometric and hyperbolic functions
- §3.3 The logarithm
- §3.5 Complex powers and inverse trigonometric functions
- §4.1 Contours
- §4.2 Contour integrals
- §4.3 Independence of path
- §4.4 Cauchy's integral theorem
- §4.5 Cauchy's integral formula
- §4.6 Bounds for analytic functions

Part III. Series expansions and residue theory

(11 lectures and 3 homework assignments)

- §5.1 Sequences and series
- §5.2 Taylor series
- §5.3 Power series
- §5.4 Convergence
- §5.5 Laurent series
- §5.6 Zeros and singularities
- §5.7 The point at infinity
- §6.1 The residue theorem
- §6.2 Trigonometric integrals
- §6.3 Improper integrals
- §6.7 Argument principle