Department of Mathematics & Statistics
Concordia University

MATH 366
Complex Analysis I
Fall 2025

Preface: This course will be taught at MB5.215. Lecture notes will be posted at the course's Moodle site as well as weekly homework assignments. All assignments should be submitted, as .pdf files, ONLINE, via Moodle.

Instructor: Dr. J. Harnad
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Class Schedule: Tuesdays & Thursdays, 10:15-11:30., Sept. 2 - Dec. 1, 2025.

Office Hours: Thursdays, 11:30 AM - 1:00 PM. (Starting Thursday, Sept. 4, 2025)

Prerequisites: MATH 264/265 or an equivalent multivariable calculus course.

Text: *Complex Variables and Applications*, 9th Edition (2014) by J. W. Brown and R. V. Churchill (McGraw-Hill Education). (**Important:** only use the 9th Edition.)
ISBN-10: 0073383171 (Hardcover edition) or 978-0073383170 (Kindle Edition)
The textbook will be available at:
https://www.bkstr.com/concordiastore/home
Note: Students should order textbooks as early as possible, especially for printed versions in case books are backordered or there are any shipping delays.

Assignments: Assignments, consisting of 8-10 problems (drawn mainly from the textbook) will be due weekly, submitted via Moodle. These are *very important* for the process of learning. They indicate the level of difficulty of the problems that students are expected to be able to solve. Every effort should be made to complete and submit all weekly assignments. The submitted assignments will be viewed by the grader and a representative sample will be graded. Complete solution sets will be posted weekly, on the day of submission, so late submissions cannot be accepted. These grades, based on the 10 best grades received, are worth 10% of the total grade. The main purpose of grading is to provide helpful feedback to the students (and the professor) on how well they are keeping up with the course material.

Use of Computer Algebra System: It is optional but recommended to install and use Maple or Mathematica. These symbolic computational tools can be used to verify and illustrate any analytical results you get while doing your assignment problems.

Calculators: Only calculators approved by the Department (with a sticker attached as a proof of approval) are permitted for the class test and final examination.
For a list of Approved and Non-approved calculators see
https://www.concordia.ca/artsci/math-stats/services.html#calculators

Midterm Exam: A **midterm exam**, covering the first seven weeks of the course, and evaluated as 30% of the total grade will be given in week 8.

Final Grade: 30% midterm, 10% assignments, and 60% final exam. The final grade assigned will be the higher one of: this total, or the one obtained by rescaling the final exam from 60 to 100.

PLEASE NOTE: Students are responsible for finding out the date and time of the final exam once the schedule is posted by the Examination Office. Any conflicts or problems with the scheduling of the final exam must be reported directly to the Examination Office, **not** to your instructor. It is the Department's policy and the Examination Office's policy **that students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

The grading scheme includes weekly assignments of which a representative subset will be graded. Students will not be told in advance which subset of the assigned problems will be graded and should try to do all assigned problems. Solutions to all the assigned problem will be posted at the course's Moodle site on the same day as they are due.

Approximate schedule of topics

Week	Chapters	Topics	Assignments (Numbering: 9th edition)	Due date
1. Sept. 2 Sept. 4	Ch. 1. Secs. 1-12	Complex numbers: algebraic properties; complex plane; conjugates, polar form; roots; regions in the complex plane	**Notation: Sec 3, #5 = 3.5** **Brown & Churchill** **3.5, 5.3, 5.5(a,b,c), 6.9, 6.15, 9.5(a,c), 9.6, 9.9, 11.5, 11.7**	Sept. 9 (assignment 1)
2. Sept. 9 Sept. 11	Ch. 2. Secs. 13-24	Analytic functions 1: mappings, limits, continuity, derivatives, Cauchy-Riemann equations, CR equations in polar coordinates, examples		Sept. 16 (assignment 2)
3. Sept. 16 Sept. 18	Ch. 2. Secs. 25-29	Analytic functions 2: harmonic functions, reflection principle, analytic continuation		Sept. 23 (assignment 3)
4. Sept. 23 Sept. 25	Ch. 3. Secs. 30-40	Elementary functions: exponential, complex exponents, trigonometric functions, hyperbolic functions, inverses, multi-sheeted function		Sept. 30 (assignment 4)

5. Sept. 30 Oct. 2	Ch. 4. Secs. 41-53	Integrals 1: Contours, contour integrals, branch cuts, Cauchy-Goursat theorem, antiderivatives, multiply connected domains		Oct. 7 (assignment 5)
6. Oct. 7 Oct. 9	Ch. 4. Secs. 54- - 59	Integrals 2: Cauchy integral formula, extensions for derivatives, Cauchy inequality, Liouville's theorem, maximal modulus principle, fundamental theorem of algebra.		Oct. 21 (assignment 6)
Oct. 11 - Oct. 17		**Reading Week**		
7. Oct. 21 - Oct. 23	Ch. 5. Secs. 60-68	Series: convergence, Taylor series, negative powers, Laurent series		Oct. 28 (assignment 7)
8. Oct. 28 Oct. 30	**Midterm Exam:** Ch. 5. Secs. 69-73	**October 28: Midterm exam** Chapters 1-4: all sections; Chapt. 5, Secs. 60-68. Absolute and uniform convergence. Continuity of power series. Integration and differentiation of power series; uniqueness; multiplication and division		Nov. 4 (assignment 8)
9. Nov. 4 Nov. 6	Ch. 6. Sec. 74 -76 Ch. 6. Sec. 77 -84	Types of singular points, isolated singular points, poles, residues at poles, Cauchy residue theorem. Residues at infinity, zeros of analytic functions, behaviour near isolated singular points, examples.		Nov. 11 (assignment 9)

10. Nov. 11 Nov. 13	Ch. 7. Sec. 85-93	Applications of residues, improper integrals, Jordan's lemma, indented paths, integration along a branch cut; definite integrals involving sines and cosines, argument principle. (Omit: Secs. 94, 95)		Nov. 18 (assignment 10)

11. Nov. 18 Nov. 20	Ch. 8. Secs. 96 - 103, 107 -111	Mapping by elementary functions: linear transformations, inverse map, mappings of the upper half-plane, linear fractional transformations, w=e^z, z^2 Maps by branched functions. Riemann surfaces.		Nov. 25 (assignment 11)
12. Nov. 25 Nov. 27	Ch. 9. Secs. 112 - 116 Ch. 8, Secs. 104-106	Conformal maps: preservation of angles, examples, harmonic conjugates, transformations of harmonic functions Review problems: mapping of regions by analytic functions		Dec. 2 (assignment 12)
Dec. ..		**Final exam**		Final exam covers all listed course topics: Chapters 1- 9.

Student Services
You may wish to access the many services available to you as a Concordia student. An overview of these resources can be found here: https://www.concordia.ca/students/services.html

Academic Integrity and the Academic Code of Conduct
This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: https://www.concordia.ca/conduct/academic-integrity.html" *[Undergraduate Calendar, Sec 17.10.2]*

Behaviour
All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

Intellectual Property

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conductt and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the Academic Regulations the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.