Department of Mathematics & Statistics
Concordia University

MATH 366
Complex Analysis I
Winter 2020

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Class Schedule: Wed., Fri., 11:45 a.m - 1:00 p.m. Jan. 6 - Apr. 9, 2020.

Office Hours: Wed., 2:00 p.m. – 3:00 p.m.

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).

Assignments: Assignments, consisting of 8-10 problems (drawn mainly from the textbook) will be due weekly. These are *very important* for the process of learning. They indicate the level of difficulty of the problems that all students are expected to be able to solve. Every effort should be made to do this, and understand them *independently*. 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 accurate 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 "Faculty approved calculators" (**SHARP EL-531** or **CASIO FX-300MS**) are allowed in examination rooms during midterm and final exams. Cell phones and any other electronic communication devices must be switched off **prior** to entering the examination room.

Test: A **midterm test**, covering the first seven weeks of the course, and evaluated as 30% of the total grade will be given in week 9.

Final Grade: The highest of the following:

- 100% final exam
- 30% midterm, 10% assignments, and 60% final exam.

The grading scheme for this course includes graded assignments of which a reasonable and representative subset will be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Approximate schedule of topics

Week	Chapters	Topics	Assignments (Numbering: 9th edition)	Due date
1. Jan. 8, Jan. 10	Ch. 1. Secs. 1-12	Complex numbers: algebraic properties; complex plane; conjugates, polar form; roots	**Notation: Sec 3, #5 = 3.5 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**	Jan. 15 (assignment 1)
2. Jan. 15, Jan. 17	Ch. 2. Secs. 13-24	Analytic functions 1: mappings, limits, continuity, derivatives, Cauchy-Riemann equations, CR equations in polar coordinates, examples	**14.6, 18.10, 24.1(a,c), 24.2(a,c), 24.4 (a,b), 24.5, 24.7(a,b)**	Jan. 22, (assignment 2)
3. Jan. 22, Jan. 24	Ch. 2. Secs. 25-29	Analytic functions 2: harmonic functions, reflection principle, analytic continuation	**26.2(a,c), ...**	Jan 29, (assignment 3)
4. Jan 29, Jan. 31	Ch. 3. Secs. 30-40	Elementary functions: exponential, complex exponents, trigonometric functions, hyperbolic functions, inverses	**30.3, ...**	Feb. 5, (assignment 4)
5. Feb. 5, Feb. 7	Ch. 4. Secs. 41-51	Integrals 1: Contours, contour integrals, branch cuts, connected domains, antiderivatives, Cauchy-Goursat theorem.	**42.2 (a,c), ...**	Feb. 12, (assignment 5)

6. Feb. 12, Feb. 14	Ch. 4. Secs. 52-57	Integrals 2: Multiply connected domains; Cauchy integral formula, extensions for derivatives	**57.3, ...**	Feb. 19, (assignment 6)
7. Feb. 19, Feb. 21	Ch. 4. Secs. 58-9 Ch. 5. Secs. 60-65	4. Liouville's theorem, maximal modulus principle, fundamental theorem of algebra. 5. Series: convergence, Taylor series	**59.1,...**	March 4, (assignment 7)
Feb. 26, Feb. 28		**Mid-term break**		
8. March 4, March 6	Ch. 5. Secs. 65-73	5. Laurent series, absolute and uniform convergence, integration and differentiation of power series; uniqueness; multiplication	**68.2, ...**	March 13 (assignment 8)
9. March 11 March 13	Midterm: March 11. Ch.6. Sec. 74-76, 78	March 11: Midterm test Closed book. Chapters 1-4: all sections; Chapt. 5, Secs. 60-65. ========== 6. Types of singular points, isolated singular points, poles, residues at poles, Cauchy residue theorem		March 13 (assignment 8)
10. March 18, March 20	Ch. 6. Sec. 77 -84 Ch. 7. Sec. 85-87	6. Cauchy residue theorem (cont'd), residues at infinity, zeros of analytic functions, behaviour near isolated singular points, examples; 7. Applications of residues, improper integrals	**77.2, ...**	March 25 (assignment 9)
11. March 25, March 27	Ch. 7. Sec. 88-93 Ch. 8. Secs. 96-100	7. Jordan's lemma, indented paths, integration along a branch cut; definite integrals involving sines and cosines, argument principle. (Omit: Secs. 94, 95) 8. Mapping by elementary functions: linear transformations, inverse map, linear fractional transformations,	**86.4, ...**	Apr. 1 (assignment 10)

12. Apr. 1, Apr. 3	Ch. 8. Secs. 101-103, 107, 108 110,111 (Omit all other sections.)	8. Mapping by elementary functions: mappings of the upper half-plane, linear fractional transformations, w=e^z, z^2, z^(1/2). Riemann surfaces	**96.5, ...**	Apr. 8 (assignment 11)
13. Apr. 8	Ch. 9. Secs. 112, 113, 114, 115, 116 (Omit all other sections)	9. Conformal maps: preservation of angles, examples, harmonic conjugates, transformations of harmonic functions		

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: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2]*