Department of Mathematics & Statistics
Concordia University

MATH 366 (MATH 601), Sec. G

Complex Analysis I

Winter 2019

Instructor: Dr. J. Harnad, Office: LB 901-25 (SGW)
Email: j.harnad@concordia.ca

Office Hours: Fridays, 14:00-15:00 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 are *very important.* They indicate the level of difficulty of the problems that all students are expected to solve and understand. Every effort should be made to do and understand them *independently*. The assignments will be corrected and a representative sample graded, with solution sets posted weekly. These grades 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 computer tools can be used to verify and illustrate any analytical results you get while doing your assignment problems.

Calculators: Electronic communication devices (including cell phones) are not allowed in examination rooms. Only "Faculty Approved Calculators" (**SHARP EL-531** or **CASIO FX-300MS**) are allowed in examination rooms during mid-term and final.

Test: A midterm test covering the first seven weeks will be given in week 8,
worth 30% of the total grade

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. 9, Jan. 11	1	Complex numbers: algebraic properties; complex plane; conjugates, polar form; roots	**Notation: Sec 3, #5 = 3.5** **3.x, 5.x, 6.x 6x, 9.x, 11.x,**	Jan. 16 (assignment 1)
2. Jan. 16, Jan. 18	2	Analytic functions 1: mappings, limits, continuity, derivatives, Cauchy-Riemann equations,	**14.x. 18.1x 24.x ,…**	Jan. 23, (assignment 2)
3. Jan. 23, Jan. 25	2	Analytic functions 2: harmonic functions, CR equations in polar coordinates, examples	**26.x, 27.x, 27.6, …**	Jan 30, (assignment 3)
4. Jan 30, Feb. 1	3	Elementary functions: exponential, complex exponents, trigonometric functions, hyperbolic functions, inverses	**30.x, 33.x, 38.x 39.x, …**	Feb. 5 (assignment 4)
5. Feb. 5, Feb. 8	4	Integrals 1: Contours, contour integrals, branch cuts, connected domains, antiderivatives, Cauchy-Goursat theorem;	**42.x, 46.x 47.x, 47.x 49.x, 53.x,…**	Feb. 13, (assignment 5)
6. Feb. 13, Feb. 15	4	Integrals 2: Multiply connected domains; Cauchy integral formula, extensions for derivatives	**57.x, …Supplementary problems:**	Feb. 20, (assignment 6)
7. Feb. 20, Feb. 22	4 (cont'd), 5	4. Liouville's theorem, maximal modulus principle, fundamental theorem of algebra. 5. Series: Convergence, Taylor series; Laurent series	**59.x,65.x, 68.x, …**	March 6, (assignment 7)
Feb. 27, March 1		**Mid-term break**		
8. March 6, March 8	5 (cont'd)	5. Laurent series, absolute and uniform convergence, integration and differentiation of power series; uniqueness; multiplication		
9. March 13, March 15	Midterm	March 13: Midterm test Midterm test, closed book (Chapters 1-4)	**72.x, 73.x. …**	March 20 (assignment 8)

10. March 20, March 2	6	Residues and poles: Isolated singular points, poles, residues, Cauchy residue theorem, residues at poles, zeroes of analytic functions, behaviour near isolated singular points.	**77.x, 79.x, 81.x, Supplementary problems**	March 27 (assignment 9)
11. March 27, March 29	7	Applications of residues: Improper integrals; indented paths, integration along a branch cut; definite integrals involving sines and cosines, argument principle. (Omit: Secs. 94, 95)	**86.x, 88.x, 91.x, 92.x, 94.x**	Apr. 3 (assignment 10)
12. Apr. 3, Apr. 5	8	Mapping by elementary functions: linear transformations, inverse map, linear fractional transformations, mappings of the upper half-plane, w=e^z, z^2 Chapt. 8, Secs. 96-100, 103, 107 only. (Omit all other sections.)	**96.x 98.x, 100.x, 106.x, 108.x 114.x, 115.x**	Apr. 10 (assignment 11)
13. Apr. 10, Apr. 12	9	Conformal maps: preservation of angles, examples, harmonic conjugates. Chapt. 9, Secs. 112, 113, 115, 116 only. (Omit all other sections)		

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]*