MATH 5120, COMPLEX FUNCTION THEORY

General information

- Instructor: Ovidiu Munteanu
- Email: ovidiu.munteanu@uconn.edu
- Lecture: MONT 320, MWF 9:05 am - 9:55 am.
- Office Hours: MF 10:00 -11:00 am in MONT 434.
- Recommended textbooks:
  Functions of One Complex Variable, by J. Conway, (2nd Edition), Springer.
  Function Theory of One Complex Variable, by R. E. Greene and S. G. Krantz, (3rd Edition), Graduate Studies in Mathematics.

The learning objectives for this course are to understand:

(1) Algebraic and topological properties of the complex plane.
(2) Analytic and meromorphic functions, conformal mappings.
(3) Möbius transformations.
(4) The Cauchy theory.
(5) The maximum modulus theorem.
(6) The Argument principle, open mapping theorem, and Rouche's theorem.
(7) Isolated singularities, residue theory and their applications.
(8) The Schwarz lemma.
(9) Extensions of holomorphic functions. The Schwarz reflexion principle.
(10) Harmonic functions on the plane: mean value theorem, harmonic conjugate.
(11) Normal families of holomorphic functions.
(12) The Riemann mapping theorem.

Grading

Homework. There will be 6 homework assignments, due on Friday of the Weeks 3, 5, 7, 9, 11, 13.

It is permitted to discuss homework with other students and/or use AI, but you must write it and understand it on your own. Late homework is not allowed.

Homework will be posted on HuskyCT in advance and be collected in class during lecture. If you can't attend the lecture, you may post your homework on HuskyCT as a single pdf file by the due date.

Date: Spring 2026.

Exams. We will have two exams, Exam 1 in Week 8 and Exam 2 in the finals week.

Exam 1: Take-home; based on material covered in Week1 – Week 6, that was tested in Hwk1 – Hwk3.

Exam 2: In class; based on material covered in Week7 – Week14, that was tested in Hwk4 – Hwk6.

Academic Integrity. It is in your best interest to maintain your academic integrity. Any form of academic dishonesty undermines the goals of this course and devalues the learning process. Academic dishonesty is a serious offense at UConn and can result in a zero grade on an assessment and/or failure in the course.

Final grades. Will be computed via the following grading breakdown:

Homework: 40%

Exam 1: 30%

Exam 2: 30%

Grading Scale.
Math 5120 is a challenging course, so it may happen that you occasionally can't solve some problems.

The *total scores* will be curved at the end of the semester according to the following rule out of 100 maximum points:

Grade	**Letter grade**
85-100	A
80-84	A-
75-79	B+
70-74	B
65-69	B-
60-64	C+
55-59	C
50-54	C-
45-49	D
0-44	F

Tentative Schedule

Week 1. The complex plane, the Riemann sphere. Holomorphic functions and the Cauchy-Riemann equations.

Week 2. Power series and analytic functions. The complex logarithm.

Week 3. Möbius transformations. Conformal mappings.
Collect Hwk 1.

Week 4. The complex integral. Cauchy's theorem, Cauchy formulas, and Cauchy estimates.

Week 5. Harmonic functions, the mean value theorem. Entire functions.
Collect Hwk 2.

Week 6. The argument principle and the Open mapping theorem.

Week 7. Removable singularities. Laurent series. *Collect Hwk 3.*

Week 8. Review, examples. *Take home Exam 1 due on Friday.*

Week 9. Residue formula. *Collect Hwk 4.*

Week 10. Meromorphic functions. Rouche theorem.

Week 11. The Schwarz lemma. The Schwarz reflection principle. *Collect Hwk 5.*

Week 12. Spaces of analytic functions. Hurwitz theorem.

Week 13. Montel theorem. The Riemann mapping theorem. *Collect Hwk 6.*

Week 14. Review, examples.