MAT 421 Complex Analysis (Discussion), Section 01, CN 24578

Class meets MWF 10:00 AM - 11:15 in SBS A210.

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Course Description: This course covers the algebra and geometry of the complex numbers; point sets, sequences and mappings; analytic functions; elementary functions; differentiation; integration; power series; the calculus of residues; and applications.

Text: Complex Analysis, by George Cain, available on Canvas

Objectives: After completing MAT 421 the student will

- understand complex numbers, the algebra and geometry of complex numbers and the complex plane
- understand and work with complex vectors, polar forms, powers, and roots
- understand limits and continuity, analyticity, and the Cauchy-Riemann equation
- understand complex exponential, trigonometric, hyperbolic, logarithmic and power functions
- understand complex integration, contour integrals, the Cauchy Integral Theorem and formula, and bounds for analytic functions
- understand sequences and series, including Taylor series, power series, and Laurent series and their use in representing analytic functions
- understand residue theory
- be able to prove basic theorems related to the above concepts
- apply mathematical reasoning and the theory of complex variables to solve theoretical and applied problems.

Prerequisites: MAT 211 and MAT 271 or equivalent with a grade of "C" or better.

Grades: Grades will be based on **three full period written examinations** (60% total), a comprehensive **final examination** (25%), and **quizzes**, **homework** and (possibly) other assignments (15%) for the remainder.
The exact grading system for your section is the following:

No makeup examinations will be given. The exams are taken in class and graded on Gradescope. If you must miss an examination for a legitimate reason, discuss this, in advance, with me, and I may then substitute the relevant score from your final examination for the missing grade. Each of the **three exams** will be graded on a 0-20 scale, then the sum of the scores is denoted by E.

Homework will be due in principle every week, and each homework is worth 10 points. The average of all homework scores is denoted by H. Homework will be submitted as a pdf with your paperwork on Gradescope. There is no need to match the pages with the problems when submitting the homework, see
https://www.youtube.com/watch?v=u-pK4GzpId0
Gradescope can be accessed from the link your Canvas course, and you can practice submitting your work on Gradescope using the assignment called Submission practice, which will remain open throughout the semester. No late homework will be accepted.

15 minutes quizzes will be given on the day after the homework was due, and will be graded on a scale from 1 to 5. The average of the quiz scores is denoted by Q. Each quiz will consist of one problem, similar but not necessarily

identical to one of the homework problems assigned for that week. The quiz will be taken in class and graded on Gradescope. No makeup quizzes will be offered.

The **final exam, will contain problems similar to problems assigned as homework throughout the semester,** will be graded out of a maximum possible 25 points. The score on the final is denoted by F. The final exam will be taken in class and graded on Gradescope.

To determine your **final grade**, compute E+H+Q+F. The maximum is 100, and the grade will be given by the rule:

A: 93-100;   A-: 90-92;   B+: 87-89;   B: 83-86;   B-: 80-82
C+: 77-79;   C: 73-76;   C-: 70-72;   D: 60-69;   F: Less than 60.

You will be able to follow your progress in the class in Canvas under Grades throughout the semester.

Extra Credit: will be announced in class.

Accommodations for Students with Disabilities: California State University, Dominguez Hills adheres to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations for students with temporary and permanent disabilities. If you have a disability that may adversely affect your work in this class, I encourage you to register with Student disAbility Resource Center (SdRC) and to talk with me about how I can best help you. All disclosures of disabilities will be kept strictly confidential. Please note: no accommodation may be made until you register with the SdRC in WH D-180. For information call (310) 243-3660 or to use telecommunications Device for the Deaf, call (310) 243-2028.

Academic Integrity: The mathematics department does not tolerate cheating. Students who have questions or concerns about academic integrity should ask their professors or the counselors in the Student Development Office, or refer to the University Catalog for more information. (Look in the index under "academic integrity".)

Tentative schedule and homework assignments

W 1/22: 1.1 Complex numbers. Introduction; 1.2 Geometry
M 1/27: 1.3 Polar coordinates; 2.1 Functions of a real variable
W 1/29: 2.2 Functions of a complex variable; 2.3 Derivatives
M 2/3: 3.1 Elementary functions. Introduction; 3.2 The exponential function
W 2/5: 3.2 The exponential function; 3.3 Trigonometric functions
M 2/10: 3.4 Logarithms and complex exponents
W 2/12: Review
M 2/17: Presidents' Day
W 2/19: Exam 1
M 2/24: 4.1 Integration. Introduction; 4.2 Evaluating integrals
W 2/26: 4.2 Evaluating integrals; 4.3 Antiderivatives
M 3/3: 5.1 Homotopy; 5.2 Cauchy's Theorem
W 3/5: 5.2 Cauchy's Theorem; 6.1 Cauchy's Integral Formula
M 3/10: 6.2 Functions defined by integrals; 6.3 Liouville's Theorem
W 3/12: 6.3 Liouville's Theorem; 6.4 Maximum moduli
M 3/17: 7.1 The Laplace equation; 7.2 Harmonic functions
W 3/19: 7.2 Harmonic functions; 7.3 Poisson's integral formula
M 3/24: Review
W 3/26: Exam 2
M 3/31: Spring Recess
W 4/2: Spring Recess
M 4/7: 8.1 Sequences
W 4/9: 8.2 Series
M 4/14: 8.3 Power series
W 4/16: 8.4 Integration of power series; 8.5 Differentiation of power series
M 4/21: 8.5 Differentiation of power series; 9.1 Taylor series
W 4/23: 9.2 Laurent series
M 4/28: 10.1 Residues; 10.2 Poles and other singularities
W 4/30: 11.2 Argument principle; 11.2 Rouché's Theorem
M 5/5: Review
W 5/7: Exam 3
F 5/9: Final review

Final examination: Monday, May 12, 10:00 AM - 12:00 PM.

Important Dates:

January 21 Tuesday Classes Begin
February 1 Saturday Summer 2025 Graduation Application Deadline – without late fee
February 6 Thursday Instructor Drop Deadline
February 6 Thursday Credit/No Credit and Audit Grading Deadline
February 8-13 Saturday-Thursday Late Registration and Add/Drop via MyCSUDH – fees due at time of registration
February 14 Friday Last Day to Drop from FT to PT Status with Refund
February 14 Friday Drop without Record of Enrollment Deadline via Change of Program Form
February 14 Friday Student Census
February 17 Monday President's Day Holiday – NO CLASSES, CAMPUS OPEN
February 17-April 18 Monday-Friday Serious and Compelling Reason Required to Withdraw
February 18-May 16 Tuesday-Saturday May Intersession 2025 Registration – fees due at time of registration
March 17-July 4 Monday-Friday Summer 2025 Registration – fees due at time of registration
March 25 Tuesday Last Day for Pro-rata Refund of Non-Resident Tuition and Tuition Fees
March 30-April 5 Sunday-Saturday Spring Recess
March 31 Monday Cesar Chavez Day Holiday – NO CLASSES, CAMPUS CLOSED
April 14-August 17 Monday-Sunday Fall 2025 Registration begins via MyCSUDH
April 15 Tuesday Summer 2025 Graduation Application – Late Deadline – with late fee
April 18 Friday First Day to file for Spring 2026 Graduation
April 21-May 9 Monday-Friday Serious Accident/Illness Required to Withdraw
May 9 Friday Last Day of Scheduled Classes
May 10-16 Saturday-Friday Final Examinations
May 10 Saturday Grade Submission Begins
May 16-17 Friday-Saturday Commencement (for more information see ceremony schedule)
May 19 Monday Evaluation Day
May 21, 3 p.m. Wednesday Final Grades Due
May 21 Wednesday Semester/Academic Year Ends