	WELCOME TO MAT 342 **Applied Complex Analysis** **Spring 2009**

All homework has been graded and is can be picked up at my office.
D. Ebin

Introduction: This is a mathematically rigorous course and most statements will come with complete proofs. Topics covered will include properties of complex numbers, analytic functions with examples, contour integrals, the Cauchy integral formula, the fundamental theorem of algebra, power series and Laurant series, residues and poles with applications, conformal mappings with applications and other topics if time permits.

Text Book: Complex Variables and Applications by James Ward Brown and Ruel V. Churchill, eighth edition, McGraw-Hill, 2009

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Office hours: Tuesday, Thursday, 11:15am-12:15pm or by appointment

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Grader: Mr. Eitan Chatav
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Office Hours: Wednesday 1:00-3:00pm in 2-104, 7:00-9:00pm in the Math Learning Center

Grading Policy: The overall numerical grade will be computed by the formula **20% Homework + 30 % Midterm Exam+ 50% Final Exam**

Homework: Homework will be assigned every week. Doing the homework is a *fundamental*

part of the course work.
1st assignment: Page 5, Prob. 2,5; page 12, prob. 2,4; page 14, prob. 2ab, 7, 13, 14; page 22, problems 8, 9 Due Feb. 5
2nd assignment: Page 30, Probs. 3a, 5, 7, 8a; Page 33, probs. 1,4,5,6,8,10 Due Feb. 12
3rd assignment: page 37, Probs. 1c,d Prob. 3 with *f(z) = x^3 - 3xy^2 +(3x^2 y -y^3)i*, Page 44, probs. 1,2,3,4,7 Due Feb. 24
4th assignment: page 55, probs. 1, 4, 5, 9 ,11, 13; page 62, probs. 3, 4, 9 Due March 3
5th assignment: page 71, probs. 2ab, 8, 10; page 77, probs. 1bd, 5, 7 Due March 10
6th assignment: page 81, probs. 2, 5, 6, 7; page 92, prob. 13; page 97, probs. 4, 11; page 108, probs. 3, 8, 10 Due March 24
7th assignment: page 121, prob. 3; page 125, probs. 2, 4, 6; page 135, probs. 8, 9,; page 140, probs. 2, 5, 7, 8 Due March 31
8th assignment: page 149, prob. 5; page 160, probs. 1abc, 3, 4, 7; page 170, probs. 3, 4, 7, 8 Due April 14
9th assignment: page 179, prob. 1, 3; page 188, prob. 4, 9a; page 195, prob. 1, 7, 8, 10, 11, 13 Due April 21
10th assignment: page 205, probs. 6, 8, 9, 11; page 219, probs. 1, 4, 5, 6, 8, 11
Due April 28
11th assignment: page 225, probs. 1, 3, 7 8; page 239, probs. 4, 5, 6; page 243, probs. 1abc, 3, 4, 5 Due May 5

Midterm Exam: Thursday, March 12, in class

MIDTERM EXAM REVIEW: Exam Review
Final Exam: Tuesday May 19, 8:00am-10:30am in the classroom, P-131.
FINAL EXAM REVIEW: Exam Review

N. B. Use of calculators is not permitted in any of the examiniations.

Special Needs: If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge you to contact the staff in the Disabled Student Services office (DDS), Room 113, humanities, 632-6748/TTD. DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disabilities is confidential.

Review for MAT342 Midterm
October 2015

Definition of complex numbers, their real and imaginary parts and absolute value and argument
Complex Conjugate, Complex numbers in polar form, Euler's formula
Exponential function and its property $\exp(z + w) = \exp(z)\exp(w)$
ϵ-neighborhood of a complex number and deleted neighborhoods, ϵ-neighborhood of ∞
Open and closed sets, boundaries and accumulation points
Convex and connected sets, domains and regions
Functions of a complex variable, polynomials and rational functions, mappings
Limits and derivatives, continuity, limits at ∞, Analytic functions, Entire functions, Cauchy-Riemann equations
Theorem: A bounded sequence has a convergent subsequence.
Corollary: A continuous real-valued function on a closed bounded set assumes a maximum and a minimum.
Rules for differention: derivatives of sum, difference, product and quotient of functions. Chain rule
Theorem: If a function has real and imaginary parts that have continuous partial derivatives and satisfy the Cauchy-Riemann equations, then it is analytic.
Harmonic functions, The real and imaginary parts of an analytic function are harmonic. harmonic conjugates
Logarithm function and trig. functions of complex variables and their derivatives and inverses, hyperbolic functions, complex exponents

Review for MAT 342 Final
December, 2015

Everything on the midterm review sheet

The absolute value of a contour integral is bounded by the length of the contour times the maximum absolute value of the integrand.
Using Anti-derivatives of analytic functions to evaluate contour integrals
The Cauchy-Goursat theorem and the the Cauchy integral formula including the formula for derivatives of analytic functions
The complex log function. Branches
Liouville's theorem and the fundatmental theorem of algebra
The maximum modulus principle
Morera's theorem
Series: geometric series, power series and Taylor series, especially for analytic functions
Radius of convergence of power series
Laurent series
Absolute and uniform convergence of power series. Differentiating and integrating power series term by term
Multiplication and division of power series
Isolated singular points: removable singularities, poles and essential singularities
An isolated singularity of a bounded function is removable
Residues and Cauchy's residue theorem
Zero's and poles of analytic functions
Using residues to evaluate integrals
Fractional linear transformations: Prove that they take lines and circles into lines or circles
Prove that given two sets of three points in the plane, there exists a fractional linear transformation that takes one set into the other
Describe all fractional linear transformations that take the upper half place into the unit disc about the origin.
Harmonic functions and harmonic conjugates. Show that on a simply connected region, every harmonic function has a harmonic conjugate
Proof that the composition of a harmonic function with an analytic function is harmonic.