

Math 595: The Cauchy-Riemann Equations in Several Variables

A certain amount of complex analysis serves as a prerequisite for research in several subjects: Algebraic Geometry, CR Geometry, Complex Differential Geometry, and Partial Differential Equations. That material revolves around the Cauchy-Riemann equations in complex Euclidean space \mathbf{C}^n and the operator $\bar{\partial}$.

We will discuss this operator from the beginning, leading to new perspectives in one complex variable as well as to research topics in the above subjects. We will present some research problems that will make excellent topics for Summer REGS projects.

Understanding the first order PDE $\bar{\partial}u = \alpha$ and the Dolbeault complex will be one of the principal goals of the mini-course. We will solve this equation on pseudoconvex domains and relate these matters to Hodge theory (an easier version!). Along the way we will introduce CR Geometry, a beautiful mixture of real and complex differential geometry, and make some connections between CR Geometry and elementary Representation Theory.

The only prerequisites for this course are a good grasp of Advanced Calculus and a knowledge of Complex Analysis in one variable (Math 542 certainly suffices).

Course Information

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The course will meet 12-12:50 MWF in 347 AH during the first 8 weeks of the semester.