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Texas A&M, April 9 −14, 2001

Lecture I. Complex Analysis: A Brief Tour into Higher Dimensions

ABSTRACT: Starting from basic standard complex analysis results in one variable, we shall visit a few of the fundamental concepts in the setting of two or more complex variables, such as extension phenomena, pseudoconvexity, zero sets, and the construction of holomorphic functions with prescribed zeroes. The goal is to illustrate how the one variable theory extends naturally to several variables. At the same time, the higher dimensional view point reveals surprising new phenomena.
The presentation will be elementary, requiring only some familiarity with complex analysis, as acquired, for example, in an undergraduate course devoted to this topic.

Lecture II. Extension Phenomena in Multidimensional Complex Analysis

ABSTRACT: After paying homage to F. Hartogs' 1906 ground breaking discovery of extension phenomena for holomorphic functions of more than one complex variable, we shall discuss analogous results for functions which satisfy the "tangential" Cauchy−Riemann equations. Along the way, we shall correct the historical record regarding the global CR extension theorem − often mistakenly attributed to S. Bochner − and of corresponding local results. We shall conclude with simple non−technical integral formula proofs of these results, which should be understandable to non−specialists.

Lecture III. Cauchy−Riemann Equations in Several Variables

ABSTRACT: Global solutions of the Cauchy−Riemann equations and their regularity properties are one of the most fundamental tools in multidimensional complex analysis. We briefly review some of the typical applications, such as the characterization of domains of holomorphy, the multidimensional version of Mittag−Leffler's construction of global meromorphic functions with prescribed poles, and approximation theorems. We shall then discuss some major problems and results on boundary regularity of such solutions, and focus, in particular, on explaining recent results on Euclidean convex domains obtained by concrete integral solution operators.