Title: The Szegő Kernel for non-pseudoconvex domains in $\mathbb{C}^2$ and an associated family of exponential integrals.

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Abstract: In the harmonic analysis approach to the Szegő and Bergman projection operators, one uses the Fourier transform to derive an explicit expression for the kernel as a certain oscillatory integral. This approach, pioneered by Nagel, Stein, Wainger, and others, yielded proofs of the $L^p$ boundedness of these operators for smoothly bounded pseudoconvex domains of finite type in $\mathbb{C}^2$. For domains that are not pseudoconvex or not of finite type, the approach is still valid, but the analysis of the resulting oscillatory integral is much more delicate. In particular, it requires detailed information about a certain family of exponential integrals. In this talk, we discuss recent and ongoing work on this problem.