1014-65-1436 **Scott R. Fulton*** (fulton@clarkson.edu), Department of Mathematics, Clarkson University, Potsdam, NY 13699-5815. *Numerical Solution of the Global Relation for Linear Elliptic Equations.*

The new transform method of Fokas reduces solving a linear elliptic equation to solving the corresponding global relation. This relation, valid for all values of a complex spectral parameter k, couples the components of the derivative on the boundary. Thus, it produces a generalized Dirichlet-Neumann map: given the derivative of the solution along any direction relative to the boundary, the derivative in the perpendicular direction is obtained without solving on the interior of the domain. The solution on the interior can then be computed via an integral representation.

For some simple domains and boundary conditions the global relation can be solved analytically; here we consider its numerical solution for the Laplace equation in an arbitrary convex polygon. The method works by approximating the components of the derivative in terms of a specified basis, using a collocation projection in the complex k-plane. We analyze the choice of collocation points, provide numerical evidence of robust performance, describe modifications which lead to enhanced convergence, and discuss extensions to other equations. (Received September 28, 2005)