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An Inverse Problem for the Double Layer Potential

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Abstract. We consider the problem of determining for which domains $\Omega \subset \mathbb{R}^n$ the number $1/2$ is an eigenvalue for the operator taking a function on the boundary $\partial\Omega$ to the boundary values of its double layer potential. This question arises naturally in I. Fredholm's solution to the Dirichlet problem for the Laplace operator in Ω . In two dimensions, the problem is equivalent to a matching problem for analytic functions which seems to be of independent interest. We show that the existence of a nontrivial solution for the matching problem characterizes the disk in a certain class of domains in the complex plane.

Keywords. Dirichlet problem, double layer potential, matching problem.

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