

The Zaremba problem in two-dimensional Lipschitz graph domains

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Abstract: We study the Zaremba problem, or mixed problem associated to the Laplace operator, in two-dimensional Lipschitz graph domains with mixed Dirichlet and Neumann boundary data in Lebesgue and Lorentz spaces. For the case when the domain is the upper-half plane, we work in the weighted setting, establishing conditions on the weights for the existence of solutions and estimates for the non-tangential maximal function of the gradient of the solution. In particular, in the L^2 -unweighted case, where known examples show that the gradient of the solution may fail to be squared-integrable, we prove restricted weak-type estimates. For the case of a general Lipschitz graph domain, we obtain an explicit value r such that the Zaremba problem is solvable in L^p for $1 < p < r$ and in the Lorentz space $L^{r,1}$. This is a joint work with Teresa Luque and Virginia Naibo.