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Properties of solutions to the biharmonic equation on non-smooth domains.

We prove boundedness of the gradient of a solution to the biharmonic equation in three dimensions, with no restrictions on the underlying domain. Furthermore, we obtain Wiener-type necessary and sufficient conditions governing the continuity of the gradient of a solution. This differs substantially from the previously known results which treated only the continuity of the solution itself.

Finally, we address a long-standing open problem due to N. Rivière regarding the well-posedness of the Dirichlet problem in L^p for the biharmonic equation on Lipschitz domains. Invoking the spectral theory of the operator pencils, we obtain a new range of p , which improves the previously known results for all $n \geq 8$ (when $n \leq 7$ the sharp results are known, due to the work of J. Pipher, G. Verchota and Z. Shen). (Received August 21, 2007)