

GEOMETRIC RIGIDITY OF OVERDETERMINED PDE'S

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A fundamental issue in the theory of variations is to examine how a geometric functional $F = F(\Omega)$ behaves under an infinitesimal domain deformation. If the functional depends smoothly on the deformation, we can take its first variation; if this is zero for all deformations we say that the given domain Ω is *critical* for the functional F . Criticality often imposes strong conditions on the geometry; ideally, one would like to understand the critical domains and possibly classify them. In each case, we will see how criticality will give rise to an overdetermined boundary value problem; hence, studying this problem, we could prove the desired rigidity. The course will approach these circle of ideas by considering the following concrete functionals: torsional rigidity, lowest Dirichlet eigenvalue, heat trace, heat content.