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An overdetermined problem with non constant boundary condition

We prove existence, uniqueness and geometric properties of a domain $\Omega$ such that a solution to the following overdetermined problem exists: $\Delta u = -1$ in $\Omega$, $u = 0$ on $\partial \Omega$, $|\nabla u(x)| = g(x)$ for $x \in \partial \Omega$, where $g$ is a given homogeneous function in $\mathbb{R}^n$.

This is a joint work with C. Bianchini and A. Henrot.