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Section:

10. Partial Differential Equations

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Phenomena of compensation and estimates for partial differential equations

Quantities like the Jacobian determinant of a mapping play an important role in several partial differential equations in Physics and Geometry. The algebraic structure of such nonlinearities allow to improve slightly the integrability or the regularity of these quantities, sometimes in a crucial way. Focused on the instance of $\frac{\partial a}{\partial x}\frac{\partial b}{\partial y}\frac{\partial a}{\partial y}\frac{\partial b}{\partial x}$, where a and $b \in H^1(\mathbb{R}^2)$, we review some results obtained on that quantity for 30 years and applications to partial differential equations arising in Geometry, in particular concerning the conformal parametrisations of constant mean curvature surfaces and the harmonic mappingss between Riemannian manifolds.

Reference: Frédéric Hélein, *Harmonic maps, conservation laws and moving frames*, Diderot éditeur, Paris 1997.