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Properties of the Level Sets of Some Products of Functions

We are interested about pairs (f, g) of C^2 -smooth functions $f, g : \mathbb{R}^n \rightarrow \mathbb{R}$ with bounded Hess^+ complements such that their product preserves this property as well. Recall that $\text{Hess}^+(f)$ stands for the set of all points $p \in \mathbb{R}^n$ such that the Hessian matrix $H_p(f)$ of the C^2 -smooth function $f : \mathbb{R}^n \rightarrow \mathbb{R}$ is positive definite. In this paper we consider two pairs of real-valued functions with empty Hess^+ complements whose products happen to have bounded Hess^+ complements.

Keywords: Level curves, Lagrange multipliers, Hessian matrix, curvature.

MSC: 47H05; 47H99.