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Existence of bounded variation solutions for a 1-Laplacian problem with vanishing potentials

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Abstract

In this work it is studied a quasilinear elliptic problem in the whole space \mathbb{R}^N involving the 1-Laplacian operator, with potentials which can vanish at infinity. The Euler-Lagrange functional is defined in a space whose definition resembles $BV(\mathbb{R}^N)$. It is proved the existence of a nonnegative nontrivial bounded variation solution and the proof relies on a version of the Mountain Pass Theorem without the Palais-Smale condition to Lipschitz continuous functionals.

Key Words. 1-Laplacian, mountain pass theorem, bounded variation functions.

AMS Classification. 35J62, 35J20.

1 Introduction and some abstract results

In general, whenever dealing with semilinear or quasilinear elliptic problems in \mathbb{R}^N , it is explored the reflexivity of the Sobolev spaces $W^{m,p}(\mathbb{R}^N)$, for $1 < p < +\infty$. In fact, the weak limits of sequences, which can be minimizing, Palais-Smale, and so on, are the candidates to be weak solutions of the problems.

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