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N-Laplacian problems with critical Trudinger-Moser nonlinearities

YANG YANG AND KANISHKA PERERA

Abstract. We prove existence and multiplicity results for an N-Laplacian problem with a critical exponential nonlinearity that is a natural analog of the Brezis-Nirenberg problem for the borderline case of the Sobolev inequality. This extends results in the literature for the semilinear case $N = 2$ to all $N \geq 2$. When $N > 2$ the nonlinear operator $-\Delta_N$ has no linear eigenspaces and hence this extension requires new abstract critical point theorems that are not based on linear subspaces. We prove new abstract results based on the $\mathbb{Z}_2$-cohomological index and a related pseudo-index that are applicable here.

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