Necessary Conditions for Weak Lower Semicontinuity on Domains with Infinite Measure

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Abstract: We derive sharp necessary conditions for weak sequential lower semicontinuity of integral functionals on Sobolev spaces, with an integrand which only depends on the gradient of a scalar field over a domain in $\mathbb{R}^n$. An emphasis is put on domains with infinite measure, and the integrand is allowed to assume the value $+\infty$.