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The Newtonian potential in a relative sense

The Newtonian potential is introduced in a relative sense for radial functions. In this way one may treat the potential theory for a larger class of functions in a unified manner for all dimensions $d \geq 1$. For example, Newton's Theorem is given in terms of relative potentials, which is a simpler statement for all dimensions. This relative potential is then used to obtain the L^1-convergence order $O(t^{-1})$ as $t \to \infty$ for radially symmetric solutions to the porous medium and fast diffusion equations. The technique is also applied to radial solutions of the p-Laplacian equations to obtain the same convergence order.