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Generalized Marcinkiewicz integrals. Preliminary report.

The Marcinkiewicz integral is defined by

$$I(x) = \int_{|y| \leq 1} \frac{\text{dist}(x + y, A)}{|y|^{n+1}} dy,$$

where $A \subset \mathbb{R}^n$ is a closed set. Obviously, $I(x) = \infty$ for $x \in \mathbb{R}^n \setminus A$, but one can show that $I(x) < \infty$ for almost every $x \in A$. This is related to the fact that on average one can improve on the estimate

$$\text{dist}(x + y, A) = o(|y|)$$

that holds for almost every $x \in A$. This observation leads to important applications of Marcinkiewicz integrals in harmonic analysis.

In my talk I will present a generalization of Marcinkiewicz integrals. This provides flexible tools for proving qualitatively sharp estimates in geometric analysis. (Received August 13, 2010)