

1118-28-90

**David Bate** and **Sean Li\***, seanli@math.uchicago.edu. *The geometry of Radon-Nikodym Lipschitz differentiability spaces II.*

Over the last two decades, the Poincaré inequality, in the sense of Heinonen and Koskela, has played a central role in the development of analysis on metric measure spaces. Cheeger and Kleiner showed that such spaces satisfy the differentiability theory of Cheeger for Lipschitz functions taking value in Banach spaces with the Radon-Nikodym property (RNP). We give a partial converse as well as a characterization of RNP Cheeger differentiability. Namely, we introduce the notion of an asymptotic nonhomogeneous Poincaré inequality for metric measure spaces and show how it is equivalent to the space satisfying RNP Cheeger differentiability. (Received January 25, 2016)