1096-28-964 **Andres del Junco***, deljunco@math.toronto.edu. *A measure-theoretic version of the divergence theorem.* Preliminary report.

(Joint work with Mustafa Akcoglu) We prove a measure-theoretic generalization of the Divergence Theorem. The result is not new but we hope to make it more accessible by giving a proof which uses only the standard tools of basic measure theory: the theorems of Egoroff, Lusin, Fubini, Radon-Nikodym and the one-dimensional Lebesgue differentiation theorem. We start by giving an abstract definition of a Gauss region in $\mathbb{R}^d$, equivalent to the notion of a BV region in geometric measure theory. We then define the boundary, boundary measure and outward normal in a purely measure-theoretic manner and obtain the Divergence theorem in terms of these concepts. Finally we show that the boundary is approximately C^1 and that the boundary measure and normal correspond to the usual geometric concepts. An interesting feature here is that this approach mimics the standard "proofs" of the Divergence Theorem found in elementary calculus texts, for regions bounded above and below by graphs of functions. (Received September 11, 2013)