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Henstock and Lebesgue integration *

Different Henstock type integration processes might have different relationship with the Lebesgue integral. For the usual higher dimensional Henstock integral Theorem 1 holds. This is not surprising since in the one dimensional case a similar result was well-known for the Denjoy and Perron integrals.

Theorem 1. *If a real function f defined on an interval $I \subset \mathbf{R}^m$ is Henstock integrable then one can always find a nondegenerate subinterval $J \subset I$ on which f is Lebesgue integrable.*

On the other hand for the v–integral defined in [P] by W.F.Pfeffer Theorem 2 holds.

Theorem 2. *There exists a v-integrable function $f : [0,1]^2 \to \mathbf{R}$ such that f is not Lebesgue integrable on any portion of* $[0,1]^2$.

Without providing the details of the proofs of the above theorems we would like to point out that the major cause of the above difference is the fact that the definition of the v-integral allows an exceptional set T. This set is small in measure theoretical sense but can be of second category.

Further references and the details of the proofs of the above theorems can be found in [Bu1] and [Bu2].

REFERENCES

[Bu1] Z. Buczolich, Henstock integrable functions are Lebesgue integrable on a portion, (to appear in Proc. Amer. Math. Soc.)

[Bu2] –, A v-integrable function which is not Lebesgue integrable on any portion of the unit square, (submitted to Acta Math. Hung.)

[P] W. F. Pfeffer, The Gauss-Green Theorem, (to appear in Trans. Amer. Math. Soc.)

* This work was accomplished while the author visited University of California at Davis.