

## Abstract of the dissertation thesis

**TITLE:**

Sigma-porous sets and the differentiation theory

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**ABSTRACT:**

The thesis consists of five research articles. In the first one, it is shown that there exists a closed upper porous (in a strong sense) subset of a nonempty, topologically complete metric space without isolated points that is not  $\sigma$ -lower porous (in a weak sense). In the second article, a new notion of porosity with respect to a measure, that generalizes the upper porosity of a measure, is introduced. Several natural definitions of this notion are investigated. The main result of this chapter is a decomposition theorem for sets that are  $\sigma$ -porous with respect to a measure. The third article deals with sets of points at which arbitrary real functions are Lipschitz from one side and not Lipschitz from another side. A full characterization of the system generated by sets of this type is proved. In the fourth article, several results on relations among metric derived numbers for functions with values in metric spaces are shown. The last chapter deals with existence of differentiable extensions for functions defined on closed subsets of  $\mathbb{R}^n$ . Its main result simultaneously generalizes the famous Whitney's  $C^1$  extension theorem and the theorem of V. Aversa, M. Laczkovich and D. Preiss on existence of differentiable (not necessarily  $C^1$ ) extensions.

**KEYWORDS:**

porous sets, porosity with respect to a measure, metric derived numbers, extensions of differentiable functions