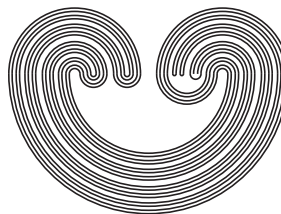


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## THE SIZE OF MULTIPLE POINTS OF MAPS BETWEEN MANIFOLDS

(WITH AN APPENDIX BY STEPAN OREVKOV)

by

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**THE SIZE OF MULTIPLE POINTS OF MAPS  
BETWEEN MANIFOLDS  
(with an Appendix by Stepan Orevkov)**

DACIBERG L. GONÇALVES

**ABSTRACT.** Let  $f : M \rightarrow N$  be a map between two connected manifolds of the same dimension. A point  $x \in M$  is called a *dominating point for  $f$*  if  $f^{-1}(f(x)) = \{x\}$ ; otherwise, it is called a *non-dominating point*. For  $M$  closed we give a criterion to decide if a given homotopy class of maps has the property that for all maps in the class the set of non-dominating points is dense. Also, we show that when the criterion holds, then the set of non-dominating points cannot be countable. The Appendix provides an example of a map  $f : S^2 \rightarrow R^2$  such that the set of dominating points is dense (or, equivalently, the set of non-dominating points doesn't contain an open set). Some facts about the size of the dominating points are derived.

**1. INTRODUCTION**

In this work we will consider continuous maps between two manifolds  $M$  and  $N$  of the same dimension where the domain  $M$  is assumed to be closed and the target  $N$  can be arbitrary. Given a map  $f : M \rightarrow N$  we say that  $x \in M$  is a *dominating point for the map  $f$*  if  $f^{-1}(f(x)) = \{x\}$ ; otherwise, it is called a *non-dominating point*. Very rarely we have that a map  $f$  is injective or, equivalently, the set of non-dominating points is

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