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(with an Appendix by Stepan Orevkov)

by

Daciberg L. Gonçalves

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Mail:	Topology Proceedings
	Department of Mathematics & Statistics
	Auburn University, Alabama 36849, USA
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THE SIZE OF MULTIPLE POINTS OF MAPS BETWEEN MANIFOLDS (with an Appendix by Stepan Orevkov)

DACIBERG L. GONÇALVES

Abstract. Let $f : M \to N$ 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 $f : S^2 \to R^2$ 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 $f : M \to N$ 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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