

LEFSCHETZ-TYPE FIXED POINT THEOREMS FOR SPHERIC MAPPINGS

JAN ANDRES* AND LECH GÓRNIIEWICZ**

*Department of Mathematical Analysis and Applications of Mathematics
 Faculty of Science, Palacký University
 17. Listopadu 12, 771 46 Olomouc, Czech Republic
 E-mail: jan.andres@upol.cz

**Institute of Mathematics, University of Kazimierz Wielki, Weyssenhoffa 11,
 85-072 Bydgoszcz, Poland
 E-mail: gorn@mat.umk.pl

Dedicated to Professor Ioan A. Rus on the occasion of his 80th birthday

Abstract. Deterministic as well as random Lefschetz-type fixed point theorems are formulated for multivalued spheric maps on various sorts of special retracts in a Euclidean space.

Key Words and Phrases: Lefschetz theorem, fixed points, spheric mappings, random operators, retracts.

2010 Mathematics Subject Classification: 55M20, 47H10, 47H04, 47H40.

Acknowledgements. The first author was supported by the grant No. 14-06958S “Singularities and impulses in boundary value problems for nonlinear ordinary differential equations” of the Grant Agency of the Czech Republic.

REFERENCES

- [1] J. Andres, L. Górniewicz, *Topological Fixed Point Principles for Boundary Value Problems*, Kluwer Acad. Publ., Dordrecht, 2003.
- [2] J. Andres, L. Górniewicz, *Random topological degree and random differential inclusions*, Topol. Methods Nonlin. Anal., **40**(2012), no. 2, 339-358.
- [3] J. Andres, L. Górniewicz, *On the Lefschetz fixed point theorem for random multivalued mappings*, Libertas Math., **33**(2013), no. 1, 69-78.
- [4] K. Borsuk, *On some metrization of the hyperspace of compact sets*, Fund. Math., **41**(1954), 168-202.
- [5] A. Dawidowicz, *Spherical maps*, Fund. Math., **127**(1987), 187-196.
- [6] A. Dawidowicz, *Méthodes homologiques dans la théorie des applications et des champs de vecteurs sphériques dans les espaces de Banach*, Dissertationes Math., Warsaw, Poland, **326**(1993).
- [7] L. Górniewicz, *Homological methods in fixed-point theory of multi-valued maps*, Dissertationes Math., **129**(1976), Warsaw, Poland.
- [8] L. Górniewicz, *Topological Fixed Point Theory of Multivalued Mappings*, Second Edition, Springer, Berlin, 2006.

- [9] L. Górniewicz, *Present state of the Brouwer fixed point theorem for multivalued mappings*, Ann. Sci. Math. Québec, **22**(1998), 169-179.
- [10] L. Górniewicz, *Fixed point theorems for multivalued maps of subsets of Euclidean spaces*, Bull. Acad. Polon. Sci. Sér. Sci. Math., **27**(1979), 111-116.
- [11] D. Miklaszewski, *A fixed point theorem for multivalued mappings with nonacyclic values*, Topol. Methods Nonlin. Anal., **17**(2001), 125-131.
- [12] D. Miklaszewski, *A fixed point conjecture for Borsuk continuous set-valued mappings*, Fund. Math., **175**(2002), 69-78.
- [13] D. Miklaszewski, *The role of various kinds of continuity in the fixed point theory of set-valued mappings*, Lecture Notes in Nonlinear Analysis, **7**(2005), Toruń, Poland.
- [14] B. O'Neill, *A fixed point theorem for multi-valued functions*, Duke Math. J., **24**(1957), no. 1, 61-62.
- [15] R. Skiba, M. Ślosarski, *On a generalization of absolute neighbourhood retracts*, Topol. Appl., **156**(2009), 697-709.

Received: June 7, 2016; Accepted: August 30, 2016.

