THE BORSUK-ULAM THEOREM
FOR QUASI-RULED FREDHOLM MAPS

MESSOUD EFENDIEV, ALE JAN HOMBURG and WOLFGANG WENDLAND

Mathematisches Institut A. Pfaffenwaldring

47. D-70550 Stuttgart

E-mail: wendland@mathematik.uni-stuttgrat.de

Dedicated to the memory of Karl Kalik

Abstract. We present an analog of the Borsuk-Ulam theorem for quasi-ruled Fredholm maps between Banach spaces. The result is applied to prove global solvability for nonlinear Riemann-Hilbert problems with Lipschitz continuous boundary conditions.

Key Words and Phrases: quasi-ruled Fredholm map, Sobolev space, Borsuk-Ulam property.

2000 Mathematics Subject Classification: 47H10, 47A53.

References

[1] C. Bessaga, *Every infinite-dimensional Hilbert space is diffeomorphic with its unit sphere,* Acad. Polon. Sci. Ser. Math., **14** (1966), 27-31.

[2] M.A. Efendiev, *Nonlinear Hilbert problem with smoothly immersion curves in $\mathbb{R}^2$,* (Russian), Izv. Nauk. Azerb SSR, Ser. Fiz-Tekhn. and Mat. Nauk, **4 3** (1982), 7-8.

[3] M.A. Efendiev, W.L. Wendland, *Nonlinear Riemann-Hilbert problems for multiply connected domains*, *J. Nonlinear Analysis*, **27** (1996), 37-58.

[4] M.A. Efendiev, W.L. Wendland, *Nonlinear Riemann-Hilbert problems without transversality*, Math. Nachrichten, **183** (1997), 73-89.

[5] M.A. Efendiev, W.L. Wendland, *Nonlinear Riemann-Hilbert problems and the similarity principle for multiply connected domains*, In: Analysis, Numerics and Applications of Differential and Integral Equations, (eds. Bach et al.) Pitman Research Notes in Math. Ser. 379, Longman, London, 1998, 81-86.

[6] P. M. Fitzpatrick and J. Pejsachowicz, *An extension of the Leray-Schauder degree for fully nonlinear elliptic problems.* In: Proceedings of Symposia in Pure Mathematics, **45**, Amer. Math. Soc. Providence, R. I. (1986), 425-439.

[7] M. Reissig, E. Wegert, *Nonlinear boundary value problems for elliptic systems in the plane*, Complex Variables, **27** (1995), 193-210.

[8] A.I. Šnirel'man, *The degree of quasi-ruled mapping and a nonlinear Hilbert problem*, Math. USSR-Sbornik, **18** (1972), 373-396.

[9] E. Wegert, *Nonlinear Boundary Value Problems for Holomorphic Functions and Singular Integral Equations*, Akademie-Verlag, Berlin, 1992.

[10] E. Zeidler, *Nonlinear Functional Analysis and its Applications; Vol.I - Fixed Point Theorems.* Springer-Verlag, Berlin, 1986.

[11] E. Zeidler, *Nonlinear Functional Analysis and its Applications; Vol.IV - Applications to Mathematical Physics.* Springer-Verlag, Berlin 1988.