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«Algebraic and geometric methods
of analysis»

Book of abstracts



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LIST OF TOPICS

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric problems in mathematical analysis
- Geometric and topological methods in natural sciences
- History and methodology of teaching in mathematics

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НТБ ОНАФТ

On nuclear operators with $\text{trace } V = 1$ and $V^2 = 0$

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In 1955, A. Grothendieck [2] has introduced the notion of the approximation property and has shown that *there exists a Banach space without the approximation property iff there exists an operator $U : c_0 \rightarrow c_0$ such that the (nuclear) trace of U equals 1 but $U^2 = 0$ identically* [2, Chap. I, "Proposition" 37. (a') \Leftrightarrow (f''), pp. 170-171].

Recall that a Banach space X has the approximation property if the identity map id_X can be approximated, in the topology of compact convergence, by finite rank operators.

An operator $T : X \rightarrow X$ is said to be s -nuclear ($0 < s \leq 1$) if there are linear continuous functionals $(f_k) \subset X^*$ and elements $(x_k) \subset X$ so that $\sum \|f_k\|^s \|x_k\|^s < \infty$ and $T(x) = \sum f_k(x)x_k$ for every $x \in X$. They say "nuclear operator" if $p = 1$.

After Per Enflo's construction of a Banach space without the approximation property [1], it was shown (see e.g. [3, 10.4.5]) that there are not only nuclear operators in c_0 with the above property but also there exists a nuclear operator T in l^1 which is s -nuclear for every $s \in (2/3, 1]$ and such that $\text{trace } T = 1$ and $T^2 = 0$.

We discuss a way to get the nuclear operators of such a kind in the spaces l^p , for all $p > 1, p \neq 2$ (in c_0 for $p = \infty$):

Theorem 1. *Let $p \in [1, \infty], p \neq 2, 1/r = 1 + |1/2 - 1/p|$. There exists a nuclear operator V in l^p (in c_0 for $p = \infty$) such that*

- (1) V is s -nuclear for each $s \in (r, 1]$;
- (2) V is not r -nuclear;
- (3) $\text{trace } V = 1$ and $V^2 = 0$.

Theorem 2. *Theorem 1 is optimal with respect to p and r .*

Note that for $p = \infty$ we have $r = 2/3$.

We give also some applications.

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