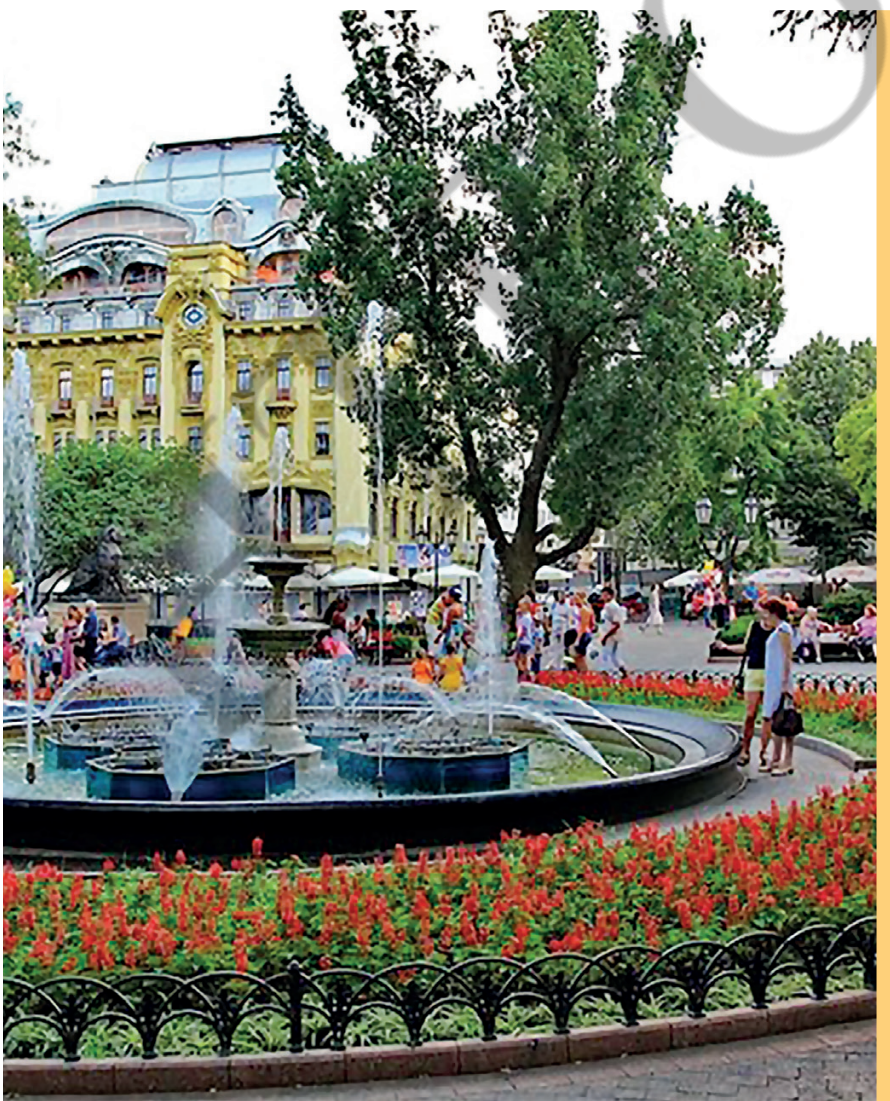
International
Scientific Conference

Algebraic and Geometric Methods of Analysis



Devoted to 160 anniversary of
Dvytro Grave
(25.08.1863 - 19.12.1939)
Academician of the Ukrainian Academy of Sciences, the first director of the Institute of Mathematics of NAS of Ukraine

May 29 – June 1, 2023
Odesa, Ukraine

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 and topological methods in natural sciences
- Geometric problems in mathematical analysis

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The conditions of hypercyclicity of weighted backward shifts

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It is well known that any infinite-dimensional separable Banach space admits hypercyclic operators while finite-dimensional does not. Hypercyclicity of linear operators is a purely infinite-dimensional phenomenon. Another infinite-dimensional phenomenon is the existence of entire analytic functions of unbounded type. The weighted backward shift, introduced by Rolewicz [1], is a significant example of hypercyclic operator. On the other hand, in the talk, we will show that by using the backward shift, it is possible to construct analytic functions of unbounded type.

Definition. An analytic function f on a Banach space is said to be a function of *bounded type,* if it is bounded on all bounded subsets of X.

We denote by $H(X)$ the space of all analytic functions on X and by $H_b(X)$ the subspace of analytic functions of bounded type. It is well known that if X is infinite-dimension, then $H_b(X)$ is a proper subset of $H(X)$. Elements of $H(X) \setminus H_b(X)$ are called analytic functions of *unbounded type* [2].

Theorem. Let P_n be a sequence of n-homogeneous polynomials on a Banach space X with $\|P_n\| = 1$ and $T\colon X \to X$ a bounded linear operator satisfying

$$0 < \limsup_{n\to\infty} \|P_n \circ T^n\|^{1/n} < \infty.$$

Suppose that there exists a dense subspace $Z_0 \subset X$ such that for every $z \in Z_0$ there is a number N such that $T^N(z) = 0$. Then

$$f(x) = \sum_{n=1}^{\infty} P_n \circ T^n(x)$$

is an analytic function of unbounded type on X.

The backward shift $(x_1, x_2, \dots,) \mapsto (x_2, x_3, \dots,)$ in ℓ_p, $1 \le p < \infty$ or c_0 is an example of the operator T.

This research was supported by the National Research Foundation of Ukraine, 2020.02/0025.

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