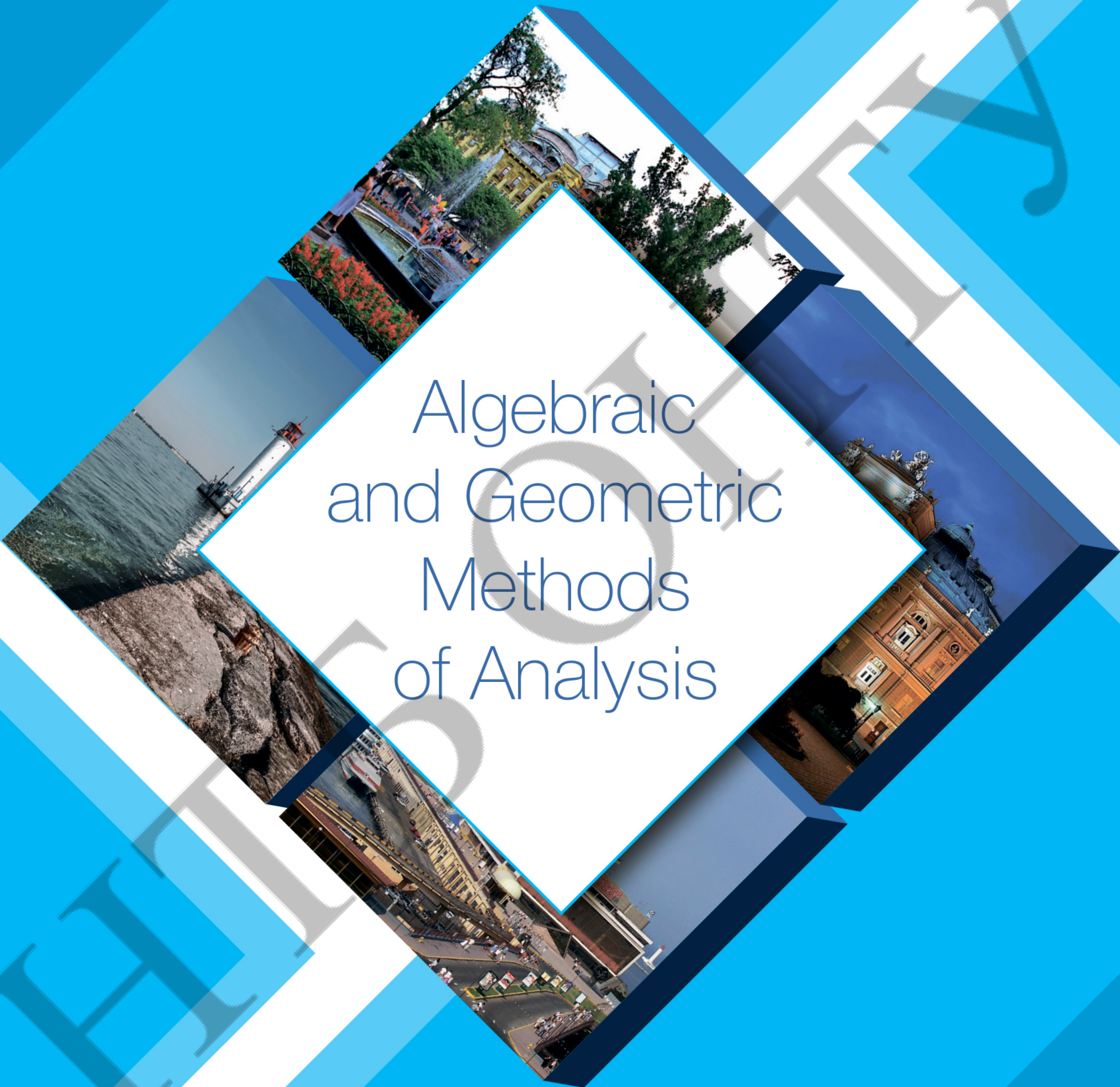
International
Scientific Conference



Algebraic and Geometric Methods of Analysis

27-30 May 2024
Odesa, Ukraine

The purpose of this conference is to bring together researchers in geometry, topology, algebra, analysis and dynamical systems and to provide for them a forum to present their recent work to colleagues from different nationalities. This way we aim to stimulate discussion about the latest findings in geometrical and topological methods in analysis and to increase international collaboration.

The conference continues the traditional annual conference «Geometry in Odesa» holding from 2004, and hosted by Odesa National University of Technology (Odesa National Academy of Food Technologies till 2021). From 2017 the conference was renamed to «Algebraic and geometric methods of analysis» (AGMA).

The Conference languages: Ukrainian and English.

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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and any fixed $0 \neq b \in Q_s \subset Q_{mr}$. When F (is not necessarily additive), then F is called b-homogeneralized derivation (multiplicative b-homogeneralized).

Theorem 2. *Let R be a semiprime ring and K be a nonzero dense ideal of R. Suppose $F\colon R \to Q_{mr}$ is a multiplicative b-homogeneralized derivation associated with derivation $d\colon R \to R$ satisfying the condition $[F(\sigma), \tau] \in Z(R)$ for all $\sigma, \tau \in K$ and any $0 \neq b \in Q_s \subseteq Q_{mr}$.*

Theorem 3. *Let R be a semiprime ring and K be a nonzero dense ideal of R. Assume $F\colon R \to Q_{mr}$ is a multiplicative b-generalized derivation associated with derivation $d\colon R \to R$ such that $F([\sigma, \tau]) = 0$ for all $\sigma, \tau \in K$ and any $0 \neq b \in Q_s \subseteq Q_{mr}$. Then either d is commuting over R is commutative or $[\sigma, b] = 0$.*

References

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[2] Mehsin Jabel Atteya, *New types of permuting n-derivations with their applications to associative rings, Symmetry*, 12,(2020) 46;doi:10.3390/sym12010046,www.mdpi.com/journal/symmetry.

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Algebra in fields extended by infinity

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Definition 1. A *corps* is a set F endowed with two binary operations $+, \cdot : F \times F \to F$ and two distinct constants $0, 1 \in F$ that satisfy the following eight axioms:

(1) $\forall x, y, z \in F \ \big(x + (y + z) = (x + y) + z\big)$;
(2) $\forall x \in F \ \ (x + 0 = x = 0 + x)$;
(3) $\forall x \in F \ \exists y \in F \ (x + y = 0 = y + x)$;
(4) $\forall x, y, z \in F \ \ (x \cdot (y \cdot z) = (x \cdot y) \cdot z)$;
(5) $\forall x \in F \ (x \cdot 1 = x = 1 \cdot x)$;
(6) $\forall x \in F \setminus \{0\} \ \exists y \in F \ \ (x \cdot y = 1 = y \cdot x)$;
(7) $\forall a, x, y \in F \ \ \big(a \cdot (x + y) = a \cdot x + a \cdot y\big)$;
(8) $\forall x, y, b \in F \ \ \big((x + y) \cdot b = x \cdot b + y \cdot b\big)$.

A corps F is called a *field* if $x \cdot y = y \cdot x$ for all elements $x, y \in F$.

Definition 2. A *procorps*[1] is a set F endowed with two binary operations $+, \cdot : F \times F \to F$ and three distinct constants $0, 1, \infty \in F$ that satisfy the following nine axioms:

(1) $\forall x, z \in F \ \forall y \in F \setminus \{\infty\} \ \ \big(x + (y + z) = (x + y) + z\big)$;
(2) $\forall x, y \in F \ \ (x + y = y + x)$;
(3) $\forall x \in F \ \ (x + 0 = x = 0 + x)$;
(4) $\forall x, z \in F \ \forall y \in F \setminus \{0, \infty\} \ \ (x \cdot (y \cdot z) = (x \cdot y) \cdot z)$;
(5) $\forall x \in F \ (x \cdot 1 = x = 1 \cdot x)$;

[1] *Procorps* is an abbreviation of a “projective corps”.

(6) $\forall x \in F\ \exists y \in F\ \ (x \cdot y = 1 = y \cdot x)$;
(7) $\forall a \in F \setminus \{0, \infty\}\ \forall x, y \in F\ \ \big(a \cdot (x + y) = a \cdot x + a \cdot y\big)$;
(8) $\forall x, y \in F\ \forall b \in F \setminus \{0, \infty\}\ \ \big((x + y) \cdot b = x \cdot b + y \cdot b\big)$;
(9) $0 \cdot 0 = 0$, $\infty \cdot \infty = \infty$ and $1 + \infty = \infty = \infty + 1$.

A procorp F is called a *profield* if $x \cdot y = y \cdot x$ for all elements $x, y \in F$.

Example 3. Let F be a corps and $\infty \notin F$. Consider the set $\bar{F} := F \cup \{\infty\}$, and extend the operations of addition and multiplication from F to $\bar{F}$ letting

$$\begin{aligned} &\forall x \in \bar{F} \setminus \{\infty\}\ \ (x + \infty = \infty = \infty + x),\\ &\forall x \in \bar{F} \setminus \{0\}\ \ (x \cdot \infty = \infty = \infty \cdot x),\\ &\infty + \infty = 0, \quad \infty \cdot 0 = 1 = 0 \cdot \infty. \end{aligned}$$

The set $\bar{F}$ endowed with the extended operations of addition and multiplication and the constants $0, 1, \infty$ is a procorps, called the *projective ∞-extension* of the corps F. If F is a field, then its projective ∞-extension $\bar{F}$ is a profield.

Example 4. The Riemannian sphere $\bar{\mathbb{C}} = \mathbb{C} \cup \{\infty\}$ is the projective ∞-extension of the field of complex numbers $\mathbb{C}$.

The following theorem shows that procorps are exactly projective ∞-extensions of corps.

Theorem 5. *For every procorps (profield) $\bar{F}$, the set $F := \bar{F} \setminus \{\infty\}$ endowed with the induced operations of addition and multiplication is a corps (field) and $\bar{F}$ is the projective ∞-extension of F.*

Variational problems in Nonsmooth Analysis

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In the last years, elliptic equations involving a nonsmooth term have attracted several outstanding mathematicians and the interest towards this kind of problems has grown more and more, not only for their intriguing analytical structure, but also in view of their applications in a wide range of contexts. Motivated by this wide interest in the literature, the leading purpose of this talk is to present some recent results on nonsmooth elliptic equations, mainly related to a wide class of functionals defined through multiple integrals of Calculus of Variations. Applications to quasilinear boundary value problems will be presented and some open problems briefly discussed; see [1] and [2, Chapter 8] for related topics.

References

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[2] G. Molica Bisci and P. Pucci, Nonlinear Problems with Lack of Compactness, De Gruyter Series in Nonlinear Analysis and Applications **36** (2021), i+vii, 1–266.

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