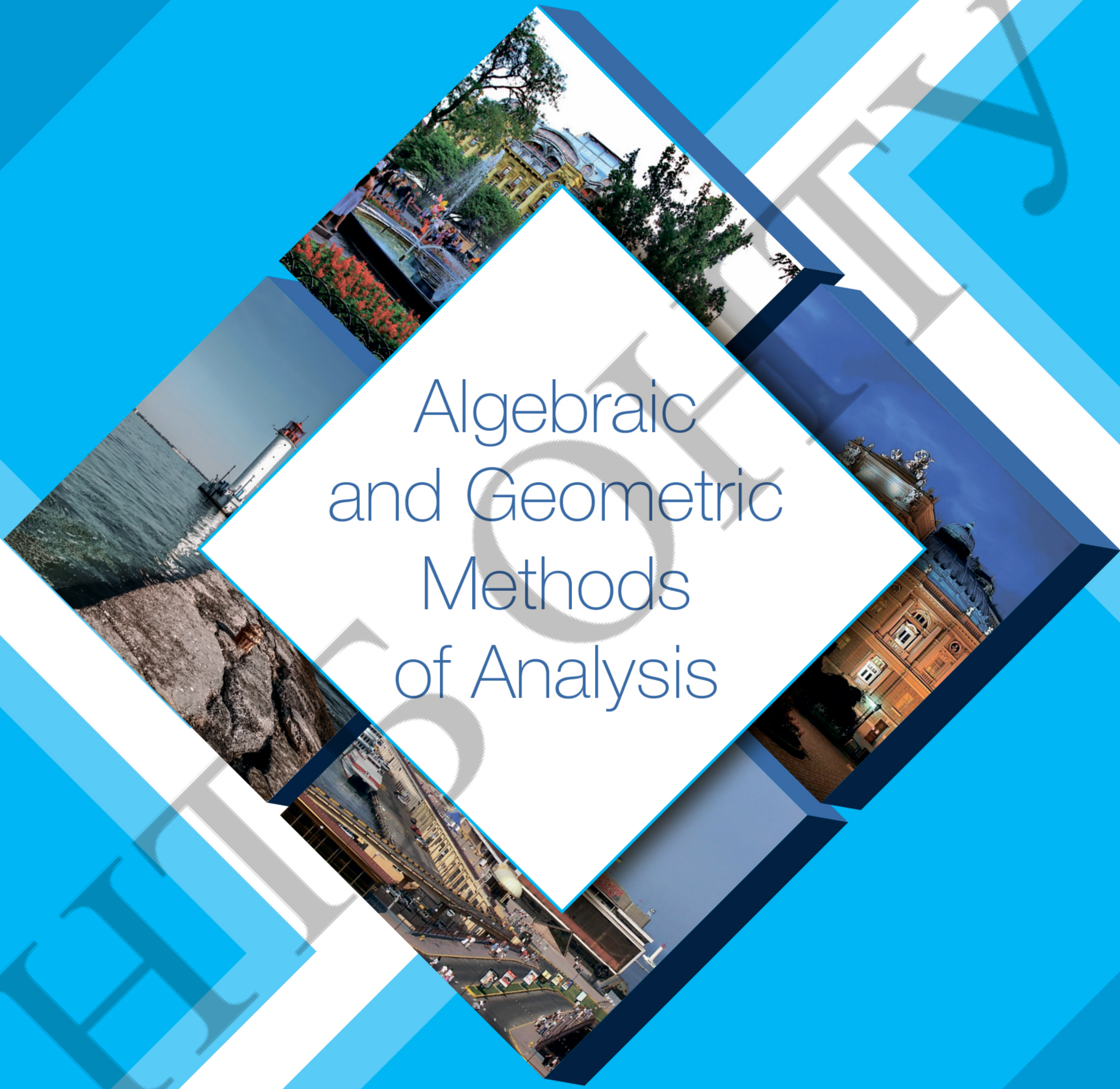
International
Scientific Conference



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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Theorem 1. *For A_2-image the following conditions are true for some numbers $C_1 > C_2 > 0$ and for each $n \in N$*

$$|f_{n+1}(x_1)-f_{n+1}(x_2)| = |f_n((1+x_1)^{-1})-f_n((1+x_2)^{-1})|+|f_n((0,5+x_1)^{-1})-f_n((0,5+x_2)^{-1})| \forall x_1, x_2 \in [0,5;1];$$

$$C_2|x_2 - x_1| \leq |f_n(x_1) - f_n(x_2)| \leq C_1|x_2 - x_1| \;\; \forall x_1, x_2 \in [0,5;1], x_1 \leq x_2.$$

References

[1] Kuzmin Rodion. On a problem of Gauss. *Dokl. Akad. Nauk SSSR Ser. A* 375-380, 1928.

[2] Levy Paul. Sur les lois de probabilite dont dependent les quotients complets et incomplets dune fraction continue. *Bull. Soc. Math. France* 57: 178-194, 1929.

[3] Pratsiovytyi Mykola., Chuikov Artem. Continuous distributions whose functions preserve tails of a A-continued fraction representation of numbers. *Random Operators and Stochastic Equations*,27(3): 199–206, 2019.

[4] Wirsing Eduard. On the theorem of Gauss-Kuzmin-Levy and a Frobeniustype theorem for function spaces. *Acta Arithmetica* 24: 506-528, 1974.

Homotopy types of stabilizers of Morse-Bott functions on 3-manifolds

Sergiy Maksymenko
(Institute of Mathematics of NAS of Ukraine)
E-mail: maks@imath.kiev.ua

Let M be a smooth 3-manifold, $\mathcal{D}(M)$ be the group of all C^∞ diffeomorphisms of M. For every smooth function $f : M \to \mathbb{R}$ denote by

$$\mathcal{S}(f) = \{h \in \mathcal{D}(M) \mid f \circ h = f\}$$

the stabilizer of f with respect to the natural action of $\mathcal{D}(M)$ on the space of all C^∞ functions on M. It consists of diffeomorphisms leaving invariant each level set of f. Endow $\mathcal{S}(f)$ with the corresponding strong C^∞ Whitney topology.

Let B be a submanifold of M. Then a *regular neighborhood* of B is a vector bundle $p\colon E \to B$ defined on an open neighborhood E of B in M and being a smooth retraction onto B. In that case a function $g\colon E \to \mathbb{R}$ is called 2-*homogeneous* if $g(tx) = t^2 g(x)$ for all $x \in E$ and $t \geq 0$.

Definition 1. Say that a Morse-Bott function $f : M \to \mathbb{R}$ is 2-*homogeneous* if for every critical submanifold B of f of dimension 1 and 2 there exists a tubular neighborhood $p\colon E \to B$ and a 2-homogeneous on fibers function $g\colon E \to \mathbb{R}$ such that $f = g$ near B.

Notice that in general (due to Morse-Bott lemma) f is 2-homogeneous only locally at each critical point x of f.

Now let $f\colon M \to \mathbb{R}$ be a C^∞ Morse-Bott function taking constant values at boundary components of M. Let also Γ be the Kronrod-Reeb graph of f, being the quotient of M by the partition into connected component of every level set of f, and $p : M \to \Gamma$ be the natural projection.

Say that an edge e of Γ is *internal* if its vertices have degrees ≥ 2, i.e. they correspond to non-extremal critical submanifodls of f. At each edge e of Γ fix a point x_e and put $N_e = p^{-1}(x_e)$. Thus, N_e is a closed subsurface of M on which f takes a constant value.

Theorem 2. *Let $f\colon M \to \mathbb{R}$ be a 2-homogeneous Morse-Bott function. Let also n be the total number of those N_e for which*

- *the edge e is internal and*
- *N_e is a 2-sphere or a projective plane.*

Then the higher homotopy groups of $\mathcal{S}(f)$ are n-powers of the corresponding 1-times higher homotopy groups of 2-sphere:

$$\pi_k\mathcal{S}(f) = \underbrace{\pi_{k+1}S^2 \times \cdots \times \pi_{k+1}S^2}_{n}, \quad k \geq 2.$$

In particular, if there are no such spheres and projective spaces, then $\mathcal{S}(f)$ is aspherical.

Elliptic Virtual Structure Constants and Generalizations of BCOV-Zinger Formula to Projective Fano Hypersurfaces

Masao Jinzenji
(Department of Mathematics, Okayama University
Okayama, 700-8530, Japan)
E-mail: pcj70e4e@okayama-u.ac.jp

Ken Kuwata
(Department of General Education
National Institute of Technology, Kagawa College
Chokushi, Takamatsu, 761-8058, Japan)
E-mail: kuwata-k@t.kagawa-nct.ac.jp

In this talk, we propose a recipe for B-model computation of genus 1 Gromov-Witten invariants of Calabi-Yau and Fano Projective Hypersurfaces. Our formalism can be applied equally to both Calabi-Yau and Fano cases. In Calabi-Yau case, drastic cancellation of terms used in our formalism occurs and it results in another representation of BCOV-Zinger formula for projective Calabi-Yau hypersurfaces.

References

[1] M. Jinzenji, K. Kuwata. *Elliptic Virtual Structure Constants and Generalizations of BCOV-Zinger Formula to Projective Fano Hypersurfaces.* Preprint, arXiv:2404.07591.

Deformation properties of smooth functions on Klein bottle

Bohdan Mazhar
(Institute of Mathematics of NAS of Ukraine, Kyiv, Ukraine)
E-mail: mazhar@imath.kiev.ua

Sergiy Maksymenko
(Institute of Mathematics of NAS of Ukraine, Kyiv, Ukraine)
E-mail: maks@imath.kiev.ua

Let M be a connected compact C^∞-smooth 2-manifold. If $X \subset M$ is a closed subset of M, then $\mathcal{D}(M, X)$ denotes the group of diffeomorphisms of M, which are identity on X, endowed with the strong Whitney topology. If $X = \varnothing$, we omit X from notation. K denotes Klein bottle.

Consider space $C^\infty(M, \mathbb{R})$ endowed with the strong Whitney topology. Then the following right action of $\mathcal{D}(M, X)$ on $C^\infty(M, \mathbb{R})$ is defined: $C^\infty(M, \mathbb{R}) \times \mathcal{D}(M, X) \to C^\infty(M, \mathbb{R})$, $(f, h) \longmapsto f \circ h$. For each $f \in C^\infty(M, \mathbb{R})$, let $\mathcal{S}(f, X)$, $\mathcal{O}(f, X)$ be the stabilizer and the orbit of f with respect to that