



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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Theorem. Let in the problem (1), (2), the vectors φ_k belongs L . There $\varphi_k, k = \{1, 2\}$ can be represented in the form (5). Then the formula

$$U(t) = \int_{\Lambda} R_{\varphi_1}(\lambda) \{M_0(t, \lambda)x(\lambda) d\mu_{\varphi_1}(\lambda) + \int_{\Lambda} R_{\varphi_2}(\lambda) \{M_1(t, \lambda)x(\lambda) d\mu_{\varphi_2}(\lambda),$$

defines solution of the problem (1), (2), $M_m(t, \lambda)$ is a solution of the problem (3), (4).

Be means of the differential-symbol method [5] we construct of the problem (1), (2).

Solution of the problem (3), (4) according to the differential-symbol [1, 2] method exists and uniqueness in the class of quasi-polynomials.

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Deformational symmetries of functions with isolated singularities on the Mobius band

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Let M be a smooth compact 2-dimensional manifold which have a non-empty boundary, and P be either a real line or a circle. Denote by $D(M, Y)$ the group of diffeomorphisms of M fixed on a closed subset $Y \subset M$. There is a natural right action of the group $D(M, Y)$ on the space of smooth functions $C^\infty(M, \mathbb{R})$ defined by the following rule: $(h, f) \mapsto f \circ h$, where $h \in D(M, Y)$, $f \in C^\infty(M, \mathbb{R})$.

Let

$$\mathcal{O}(f, Y) = \{f \circ h \mid h \in D(M, Y)\}$$

be the *orbit* of f under this action. Endow $C^\infty(M, \mathbb{R})$ with Whitney C^∞ -topology and $\mathcal{O}(f, Y)$ with induced one.

Definition 1. Denote by $\mathcal{F}(M, P)$ the space of smooth maps $f \in C^\infty(M, P)$ having the following properties:

- (1) the map f takes constant values at each connected component of ∂M and has no critical points on it;
- (2) for every critical point z of f there is a local presentation $f_z: \mathbb{R}^2 \rightarrow \mathbb{R}$ of f near z such that f_z is a homogeneous polynomial $\mathbb{R}^2 \rightarrow \mathbb{R}$ without multiple factors.

Definition 2. Let G, H be groups, $m \in \mathbb{Z}$ and $\gamma: H \rightarrow H$ be automorphism of order 2. Define the automorphism $\phi: G^{2m} \times H^m \rightarrow G^{2m} \times H^m$ by the formula

$$\phi(g_0, \dots, g_{2m-1}, h_0, \dots, h_{m-1}) = (g_{2m-1}, g_0, \dots, g_{2m-2}, h_1, h_2, \dots, h_{m-1}, \gamma(h_0)).$$

This automorphism ϕ generates homomorphism $\phi': \mathbb{Z} \rightarrow G^{2m} \times H^m$. The corresponding semidirect product $G^{2m} \times H^m \rtimes_{\phi'} \mathbb{Z}$ will be denoted $(G, H) \wr_{\gamma, m} \mathbb{Z}$.

Definition 3. Let \mathcal{P} be a minimal class of groups satisfying the following conditions:

- 1) $1 \in \mathcal{P}$;
- 2) if $A, B \in \mathcal{P}$, then $A \times B \in \mathcal{P}$;
- 3) if $A \in \mathcal{P}$ and $n \geq 1$, then $A \wr_n \mathbb{Z} \in \mathcal{P}$.

It was shown in [2] that if M has negative Euler characteristic, then fundamental groups of orbits of functions in $\mathcal{F}(M, P)$ are direct products of such groups for functions only on cylinders, disks and Möbius bands. Moreover, if M is either a 2-disk or a cylinder, then $\pi_1 \mathcal{O}(f, \partial M) \in \mathcal{P}$.

Theorem 4. Let M be a Möbius band and let $f \in \mathcal{F}(M, P)$. Then

$$\pi_1 \mathcal{O}(f, \partial M) \cong A \times (G, H) \wr_{\gamma, m} \mathbb{Z}, \text{ where } A, G, H \in \mathcal{P}.$$

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Codes from zero-divisor super- λ graph

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In coding theory, super- λ graphs were used to build linear codes. Thus, in order to see whether the zero-divisor graphs might be useful into this context, it is natural to study when zero-divisor graphs of some non elementary ring constructions are super- λ graphs. In this presentation, we show that there are various classes of rings whose zero-divisor graphs are super- λ . We apply these results to determine parameters of some linear codes associated to zero-divisor graphs.

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V. Dryuma <i>On geodesic lines of Riemannian metric for Navier-Stokes equations</i>	29
L. Fardigola, K. Khalina <i>On controllability problems for the heat equation in a half-plane in the case of a pointwise control in the Dirichlet boundary condition</i>	32
V. Fedorchuk, V. Fedorchuk <i>On partial preliminary group classification of some class of $(1 + 3)$-dimensional Monge-Ampere equations. Two-dimensional Abelian Lie algebras</i>	34
B. Feshchenko <i>Homotopy type of stabilizers of functions with non-isolated singularities on surfaces</i>	36
N. Glazunov <i>On direct limits of Minkowski's balls, domains, and their critical lattices</i>	37
O. Gok <i>On KB(Kantorovich-Banach) spaces and KB operators</i>	39
M. Golański <i>On polynomial and regular maps of spheres</i>	40
O. Gutik, O. Prokhorenkova <i>On homomorphisms of bicyclic extensions of archimedean totally ordered groups</i>	41
O. Hukalov, V. Gordevskyy <i>The Interaction of an Infinite Number of Eddy Flows</i>	42
S. Ivković <i>Semi-Fredholm theory in unital C^*-algebras</i>	43
T. Jaiyeola, K. Ilori, O. Oyebola <i>On some non-associative hyper-algebraic structures</i>	45
J.-L. Mo <i>The rank of Mordell-Weil groups of surfaces</i>	47
J. Kąkol <i>On Asplund spaces $C_k(X)$ with the compact-open topology</i>	48
N. Kitazawa <i>Explicit construction of explicit real algebraic functions and real algebraic manifolds via Reeb graphs</i>	49
N. Kononenko <i>Conformal equivalence of 3-webs</i>	51
Y. Kopeliovich <i>The fundamental group of Riemann surface via Riemann's existence theorem</i>	52
G. Kuduk <i>Problem with integral conditions for evolution equations in Banach space</i>	53
I. Kuznietsova, S. Maksymenko <i>Deformational symmetries of functions with isolated singularities on the Mobius band</i>	54
R. L'hamri <i>Codes from zero-divisor super-λ graph</i>	55
L. Lotarets <i>Twisted Sasaki metric on the unit tangent bundle and harmonicity</i>	56