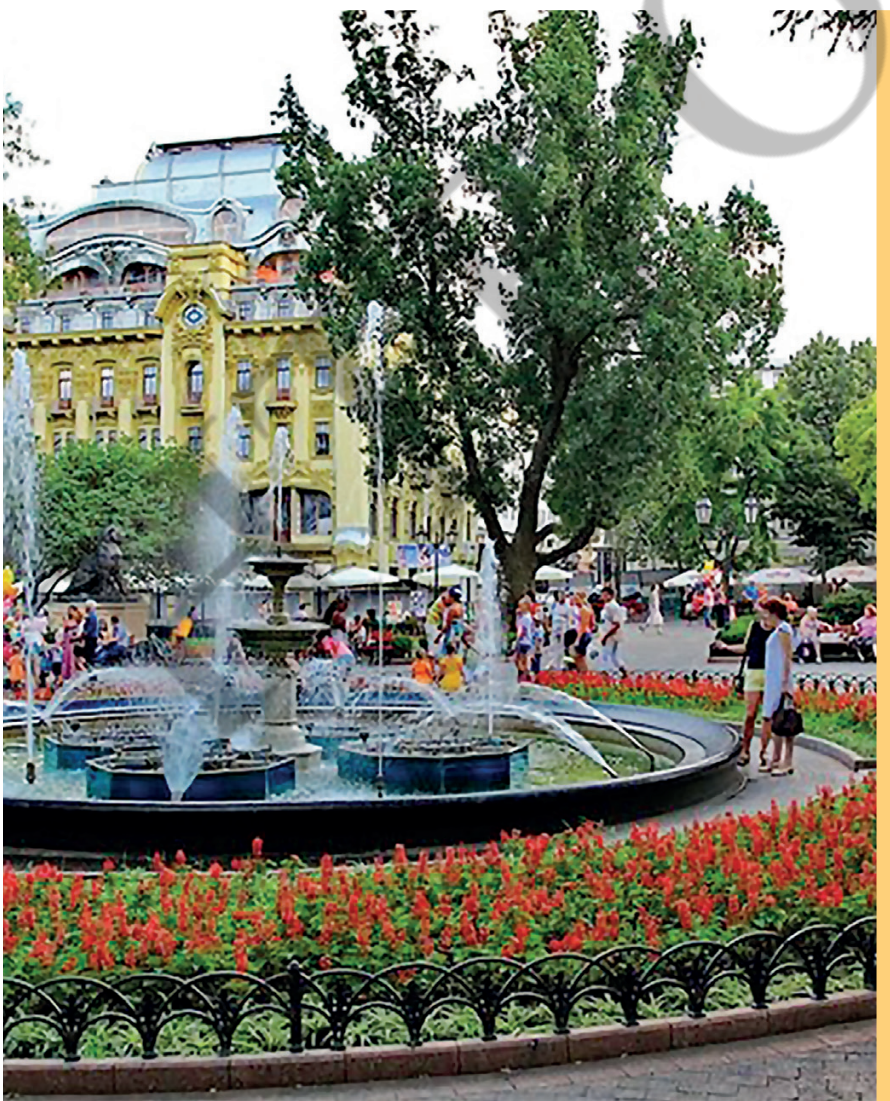
International
Scientific Conference

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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- Ministry of Education and Science of Ukraine
- Odesa National University of Technology
- Institute of Mathematics of the National Academy of Sciences of Ukraine
- Taras Shevchenko National University of Kyiv
- Kyiv Mathematical Society

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(ii) $x(yZ \cdot y) = (xy \cdot Z)y$
(iii) $x(Yz \cdot Y) = (xY \cdot z)Y$
(iv) $X(yZ \cdot y) = (Xy \cdot Z)y$
(v) $X(Yz \cdot Y) = (XY \cdot z)Y$ *(vi)* $x(YZ \cdot Y) = (xY \cdot Z)Y$
(vi) $X(YZ \cdot Y) = (XY \cdot Z)Y$ *for all* $x, y, z \in P$ *and* $X, Y, Z \subseteq P$.

Example 6. Let $(\mathbb{Z}_2, +, \cdot)$ be the ring of integer modulo 2 and let $G = \mathbb{Z}_2^3$. For (i, j, k) and (p, q, r) in G, define

$$(i, j, k) * (p, q, r) = (i + p, j + q, k + r + jpq).$$

Consider $\mathbb{Z}_2^3//N \subseteq P(\mathbb{Z}_2^3)$ where $N = N(\mathbb{Z}_2^3, *) = \{(0, 0, 0), (0, 1, 0), (1, 0, 0), (0, 1, 1)\}$ is the nucleus of $(\mathbb{Z}_2^3, *)$ so that

$$\mathbb{Z}_2^3//N = \Big\{\big\{(i, j, k), (i, j + 1, k), (i, j, k + 1), (i + 1, j, k), (i, j + 1, k + 1)\big\} \mid i, j, k \in \mathbb{Z}_2\Big\}.$$

Define an hyperoperation $'\circ'$ on $\mathbb{Z}_2^3//N$ as follows

$$(i, j, k)N \circ (p, q, r)N = \Big\{\Big\{\big(i + a + p, j + b + q, k + c + jab + r + (j + b)pq\big),$$
$$\big(i + a + p, j + b + q + 1, k + c + jab + r + (j + b)pq\big), \big(i + a + p, j + b + q, k + c + jab + r +$$
$$(j + b)pq + 1\big), \big(i + a + p + 1, j + b + q, k + c + jab + k + (j + b)pq\big),$$
$$\big(i + a + p, j + b + q + 1, k + c + jab + r + (j + b)pq + 1\big)\Big\} \;\Big|\; i, j, k, p, q, r \in \mathbb{Z}_2, a, b, c \in N\Big\}.$$

Then, $\Big(\mathbb{Z}_2^3//N, \circ\Big)$ is a right Bol polyloop.

References

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[2] Oyebola, O.O. and Jaiyéọlá, T. G. Non-associative algebraic hyperstructures and their applications to biological inheritance. *Monografías Matemáticas García de Galdeano* 42: 229–-241, 2019.

The rank of Mordell-Weil groups of surfaces

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Let $S \longrightarrow C$ be a fibraton of surface, and we can define Mordell-Weil groups. In fact, they are Abelian groups. In 1989, Prof. Mok raised the following question in [1]:

Problem 1. How to determine the rank of Mordell-Weil group >0?

In [2] and [4], the authors discuss the above problem. In this talk, we try to give some new views in this problem. Especially, we use the number of singular fibers to determine whether the rank is zero or not.

Theorem 2. *Let* $S \to \mathbb{P}^1$ *be a fibraton of surface. If* $s_1 > 4g$*, then the rank of Mordell-Weil group* > 0*, where* s_1 *is the number of fiber whose Jacobian is singular.*

We will also discuss the following similar problem in this talk.

Problem 3. How to determine the Mordell-Weil group is trivial or not?

Prof. Kitagawa and Prof. Konno used the pencils of surfaces to consider this problem in [3]. Here, we give the following theorem for elliptic fibrations in another way.

Theorem 4. *Let $S \longrightarrow \mathbb{P}^1$ be an elliptic fibration of surface with s singular fibers. If $s > 3$, then Mordell-weil group is not trivial.*

For the above two problems, our results are the best. Because we have the following example:

Example 5. The Weiestrass equation $y^2 = x^3 - t^4x + t^5$ corresponds to an ellptic fibration over $\mathbb{P}^1$ with II^*, I_1 and I_1 at $t = 0,\ t = \pm\frac{3\sqrt{3}}{2}$. It is easy to see that Trivial lattice is E_8, and Mordell-Weil group is trivial.

References

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[2] Gong, C; Sun, H : An inequality on the Hodge number $h^{1,1}$ of a fibration and the Mordell-Weil rank. Turkish J. Math. 42 (2018), 578–585.

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On Asplund spaces $C_k(X)$ with the compact-open topology

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Recall that a Banach space E is called an Asplund space if every separable Banach subspace of E has separable dual. A celebrated theorem of Namioka and Phelps says that for a compact space X, the Banach space $C(X)$ of continuous real-valued functions on X is Asplund if and only if X is scattered. We extend this result to the class of spaces $C_k(X)$ of continuous real-valued functions endowed with the compact-open topology for several natural classes of non-compact Tychonoff spaces X. The concept of Δ_1-spaces recently introduced and studied has been shown to be applicable for this research.