SEMI-ANNUAL REPORT OF "MATHEMATICAL ANALYSIS" DEPARTMENT ON SCIENTIFIC AND SCIENTIFIC ACTIVITY FOR 2024

The staff of "Mathematical Analysis" department consists of 13 research associates, including 4 doctor of sciences, professor, one corresponding member of ANAS.

1) Vagif Guliyev – head of department (doct. phys. math. sci. prof. Corr. member of ANAS).

2) Rovshan Bandaliyev- doct. math. sci., senior researcher

3) Elman Ibrahimov – doct. math. sci., senior researcher

4) Hajibeyov Mubariz- doct. math. sci., senior researcher

5) Zaman Safarov - cand. phys. math. sci., ass. prof., leading researcher

6) Mehriban Omarova – ph. doctor in math., ass. prof., leading researcher

7) Elmira Hajiyeva – cand. phys. math. sci., res. ass.

8) Lala Aliyeva - ph. doctor in math., ass. prof., great researcher

9) Fatayi Isayev – ph. doctor in math., great researcher

10) Aytekin Abdullayeva – ph. doctor in math., great researcher

11) Aynur Mammadova – ph. doctor in math., great researcher

12) Aydın Gül Aydın - junior researcher.

13) Aliyeva Dunya Rasul - junior researcher.

I. SCIENTIFIC PART

In 2024, according to the affirmed plan, six scientific works on the themes of **"**Modern problems of harmonic analysis" are carried out.

Work 1: Boundedness and applications of sublinear operators and their commutators generated by a potential operator on weighted Morrey spaces in homogeneous Lie groups.

Executors: Head of department, corr. member of ANAS, prof. V.S. Guliyev, ph. doctor in math., ass. prof., lead. res. M.N. Omarova

The works on boundedness and applications of sublinear operators and their commutators generated by a potential operator on weighted Morrey spaces in homogeneous Lie groups are

investigated. Based on the results of researches, the following papers were published. Studies on this work are carried out.

1. A. Akbulut, S. Celik, M.N. Omarova, *Fractional maximal operator associated with Schrodinger operator and its commutators on vanishing generalized Morrey spaces*, Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics, 44 (1), 3-19 (2024). (Scopus, Q3, IF 0.23).

   https://doi.org/10.30546/2617-7900.44.1.2024.3

2. V.S. Guliyev, F.A. Isayev, A. Serbetci, *Boundedness of the anisotropic fractional maximal operator in total anisotropic Morrey spaces*, Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics, 44 (1), 41-50 (2024). (Scopus, Q3, IF 0.23).

   https://doi.org/10.30546/2617-7900.44.1.2024.41

Tehsis

1. V.S. Quliyev, Characterization of BMO and Lipschitz functions via the commutators of the fractional maximal function in Orlicz spaces on stratified Lie groups,"Riyaziyyat, mexanikanın müasir problemləri və tətbiqləri" adlı Beynəlxalq konfrans, 20-22 iyun, 2024, Bakı, Azərbaycan.

2. V.S. Quliyev, M.N. Omarova, Commutator of nonsingular integral operator on generalized weighted Orlicz-Morrey spaces, Nəsirəddin Tusinin xatirəsinə həsr olunmuş "Riyaziyyat və Mexanikanın Müasir Problemləri" adlı XI beynəlxalq elmi konfransı, pp. 326-328, 03-06 iyul, 2024, Bakı, Azərbacan.

   https://mpmm.imm.az/pages/abstracts

3. M.N. Omarova, Gloal regularity in weighted Orlicz-Morrey spaces of solutions to parabolic equations with VMO coefficients, "Riyaziyyat, mexanikanın müasir problemləri və tətbiqləri" adlı Beynəlxalq konfrans, 20-22 iyun, 2024, Bakı, Azərbaycan.

Work 2: Hardy type operators and their characterization by fractional order differential equations.

Executors: doct. math. sci., senior researcher Rovshan Bandaliyev., cand. phys. math. sci., ass. prof., lead. res. ass Zaman Safarov, j.r. D.R. Aliyeva

Hardy-type operators and their characterization by fractional structure ordinary differential equations are investigated. Based on the results of researches, the following papers were published. Studies on this work are carried out.

1. R.A. Bandaliyev, D.R. Aliyeva, *A characterization of two-weight norm inequalities for multidimensional Hausdorff operators on Lebesgue spaces*, Positivity, 28(2), 1-13(2024). (WoS, SCIE, IF-1, Q2)

    https://link.springer.com/article/10.1007/s11117-024-01031-w

Tehsis

2. R.A. Bandaliyev, K. A. Babayeva, Kh. S. Nasirova, Hardy's inequalities in weighted variable exponent Lebesgue spaces with negative exponents, International conference "Modern problems and applications of mathematics, mechanics", June 20-22, 2024, Baku, Azerbaijan.

3. R.A. Bandaliyev, B. S. Jafarova, A. A. Rufullazade, Twoweight inequalities for Hausdorff operator In Lebesgue spaces with indices, International conference "Modern problems and applications of mathematics, mechanics", June 20-22, 2024, Baku, Azerbaijan.

4. K.K. Omarova, E.Ibayev, A.Bandaliyev, Obtaining a fractional differential equation for the Laplace transform of the boundary functional of a stepwise semi-Markov process, International conference "Modern problems and applications of mathematics, mechanics", June 20-22, 2024, Baku, Azerbaijan.

5. R.A. Bandaliyev, A.G. Mehdiyev, Leyla Sh. Gadimova, Two weight inequalities for the sublinear operator in weighted Banach function spaces equations, International conference "Modern problems and applications of mathematics, mechanics", June 20-22, 2024, Baku, Azerbaijan.

6. C.Aykol, J.J. Hasanov, Z.V. Safarov, Commutators of two-weighted Φ-admissible singular operators on generalized weighted Orlicz-Morrey spaces, XI international

scientific conference dedicated to the memory of Nasireddin Tusi "Modern Problems of Mathematics and Mechanics", July 03-06, 2024, Baku, Azerbaijan.

https://mpmm.imm.az/pages/abstracts

Work 3: Boundedness of maximal and fractional maximal operators on hypergroups in weighted Lebesgue spaces of variable exponent.

Executors: doct. math. sci., senior researcher Hajibeyov Mubariz. , cand. phys. math. sci., res. ass Elmira Hajiyeva

Boundedness of given maximal and fractional maximal operators in hypergroups in weighted Lebesque spaces of variable degree was investigated. Studies on this work are carried out.Based on the results of researches, the following papers were published. The thesis was published at the International Conference.

1. M.G. Hajibayov, R.Sh. Huseynzade, Peano differentiability of Riesz potentials, XI international scientific conference dedicated to the memory of Nasireddin Tusi "Modern Problems of Mathematics and Mechanics", July 03-06, pp. 328-330, 2024, Baku, Azerbaijan.

https://mpmm.imm.az/pages/abstracts

Work 4: Criterion for the boundedness of a fractional integral operator generated by Gegenbauer differential operator in generalized Morrey spaces.

Executor: doct. math. sci., senior researcher Elman Ibrahimov, j.r. G.A. Aydin.

Work on the criterion for the boundedness of the fractional integral operator generated by Gegenbauer differential operator in generalized Morrey spaces are carried out. Based on the results of researches, the following papers were published.

1. E.J.Ibrahimov, G.A.Dadashova, S.A. Jafarova, *Boundedness of Gegenbauer fractional maximal commutator on generalized Gegenbauer-Morrey spaces*, Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics, 44 (1), 1-35 (2024) (Scopus, Q3, IF 0.23).

https://doi.org/10.30546/2617-7900.44.1.2024.83

Tehsis

2. E.J.Ibrahimov, Characterization of G-Lipschitz spaces via commutators of the *G*-maximal function, XI international scientific conference dedicated to the memory of Nasireddin Tusi "Modern Problems of Mathematics and Mechanics", July 03-06, pp. 331-333, 2024, Baku, Azerbaijan.

https://mpmm.imm.az/pages/abstracts

3. Gül Aydin, Boundedness of Gegenbauer fractional maximal operator generalized Gegenbauer-Morrey spaces, XI international scientific conference dedicated to the memory of Nasireddin Tusi "Modern Problems of Mathematics and Mechanics", July 03-06, pp. 323-325, 2024, Baku, Azerbaijan.

https://mpmm.imm.az/pages/abstracts

Work 5: Two-weighted inequalities for the sublinear operator and its commutator generated by the parabolic B-potential integral.

Executors: cand. phys. math. sci., ass. prof., great researcher Lala Aliyeva, ph. doctor in math., great researcher Fatayi Isayev

Studies on two-weighted inequalities for a sublinear operator and its commutator generated by a parabolic B-potential integral is continued. Functional spaces defined by generalized characteristics of high-order oscillations of a locally summable function are also investigated, as well as a theorem on the isomorphism of these spaces. As a result of research, the article was given to publish.The thesis was published at the International Conference.

1. V.S. Guliyev , F.A. Isayev, A. Serbetci, *Boundedness of the anisotropic fractional maximal operator in total anisotropic Morrey spaces*, Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics, 44 (1), 41-50 (2024). (Scopus, Q3, IF 0.23).

https://doi.org/10.30546/2617-7900.44.1.2024.41

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Tehsis

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1. R.M.Rzaev, L.R. Aliyeva, Approximation of functions by singular integrals in the terms of higher order mean oscillation, XI international scientific conference dedicated to the memory of Nasireddin Tusi "Modern Problems of Mathematics and Mechanics", July 03-06, pp. 352-354, 2024, Baku, Azerbaijan.

Work: 6. Weighted Besov space. Expression of this space in terms of weighted continuity modulus. Equivalent norms.

Executors: ph. doctor in math., great researcher Aytekin Abdullayeva, ph. doctor in math., great researcher Aynur Mammadova.

Weighted Besov space. The work on the statement of this space with the weighted continuity module and the subject of equivalent norms is continued. As a result of research, the article was given to publish.The thesis was published at the International Conference.

1. A.N. Mammadova, A.E. Abdullayeva. The estimates of approximation by weighted modulus of continuity in Lebesgue spaces, XI international scientific conference dedicated to the memory of Nasireddin Tusi "Modern Problems of Mathematics and Mechanics", July 03-06, pp. 338-339, 2024, Baku, Azerbaijan.

II SCIENTIFIC ORGANIZATIONAL ACTIVITY

- The main priority of the department is modern problems of harmonic analysis.

- In the department the research works are carried out on 6 themes.

- The department staff consists of 13 collaborators. One of them is a professor (corr. member of ANAS), one doctor of sciences (professor of ANAS), 4 associate professor.

- Prof. V.S., Guliyev, doct. math. sci., senior researcher Rovshan Bandaliyev, doct. math. sci., senior researcher Elman Ibrahimov,ph. doctor in math., senior researcher Fatayi Isayev , ass. prof., lead. res. M.N. Omarova, cand. phys. math. sci., ass. prof., senior researcher Lala Aliyeva,: ph. doctor in math., senior researcher Aytekin Abdullayeva, ph. doctor in math., senior researcher Aynur Mammadova, G.A. Aydin, D.R. Aliyeva took part in seminars. In the first quarter of annual report member of department, doct. math. sci., senior researcher Elman Ibrahimov delivered talk over the topic of "Strong and weak type inequalities for maximal fractional functions and fractional integral operators derived from Gegenbauer differential operators".

- Under the management of V.S. Guliyev seminars of the department named "Actual Issues of Harmonic Analysis" continued its activity on the fourth day of every week. In the seminars, prof .V.S.Guliyev, doct. math. sci., senior researcher Rovshan Bandaliyev, ph. doctor in math.,

senior researcher Fatayi Isayev , ass. prof., lead. res. M.N. Omarova, doctoral student of the department J. Azizov give seminars.

- Prof. V.S. Guliyev has continued his activity as a member of the The High Attestation Commission under the President of the Republic of Azerbaijan.

- Prof. V.Guliyev is one of the editors-in-chief of "Caspian journal of applied mathematics, ecology and economics", editor-in-chief in mathematics issues of "AMEA-nın Xəbərləri" (Fizika-texnika və riyaziyyat elmləri seriyası) and Deputy Editor-in-Chief of the international journal "Applied and Computational Mathematics". While being also member in the editorials board of many international "Journal of Nonlinear Sciences and Applications" (J. Nonlinear Sci. Appl.), "Eurasian Mathematical Journals", "Communications de la Faculté des Sciences de l'Université d'Ankara. Séries A1. Mathematics and Statistics", "TWMS Journal of Pure and Applied Mathematics" and other local Proceedings of Institute of Mathematics and Mechanics of NAS of Azerbaijan", "Azerbaijan Journal of Mathematics" journals.

- Statistics related to the references in "Google Scholar" to the papers of memners of ANAS in the department of Physics ,Mathematics and Technical Sciences have become released.Vagif Guliyev was the most mentioned person in the list.

- Under the management of Prof V.Guliyev as an editor-in-chief, **vol. 44, no. 1, 2024** issue of ″Transactions of Azerbaijan National Academy of Science, Issue Mathematics, Series of physical-technical and mathematics science″ was completed and released. Works on **vol. 44, no 4, 2024** issue of journal are going on.

- The department staff continue scientific relations with well-known scientists of many prestigious universities of the world. Of these, prof. Yoshihiro Sawano (Tokyo Metropolitan University, Japan), prof. Stefan Samko (Alvarge University, Portugal), prof. Maria Alessandra Ragusa (University of Catania, Italy), prof. Viktor Burenkov (Peoples' Friendship University, Russia, Moscow), Ayhan Serbetchi (Ankara University, Ankara, Turkey).

- Among the staff of the department, Assoc. R. Bandaliyev at the Azerbaijan University of Architecture and Construction, Assoc. M.Hadzhibekova at the National Aviation Academy, Assoc. Z. Safarov, Azerbaijan State University of Oil and Industry, Assoc. M.Omarova is also engaged in pedagogical activities at the Baku State University.

- At the meeting of the Dissertation Council of ED 1.04 on June 21, 2024, where dissertations submitted for the degree of Doctor of Science and Doctor of Philosophy at the Institute of Mathematics and Mechanics were defended, the doctoral student of the department Javanshir Vagif oglu Azizov was defended the dissertation on the title "The boundedness of fractional maximal and fractional integral operators defined in the Heisenberg group in generalized weighted Morrey spaces" on June 21, 2024. 1202.01- the defense of the candidate's dissertation will take place in the specialty "Analysis and functional analysis" in the field of mathematics.

- In the first quarter of annual report 4 articles of departament staff (1 foreign, 3 local journals, 1 impact factor, 3 Scopus) articles were published by the department staff. 13 theses were were published, 4 articles were accepted for publication, and 11 articles were submitted for publication.

    Head of the department   **Corr. member of NASA,**

    "Mathematical Analysis"   **prof. V.S. GULIYEV**