

## SEMI-ANNUAL REPORT OF “MATHEMATICAL ANALYSIS” DEPARTMENT ON SCIENTIFIC AND SCIENTIFIC ACTIVITY FOR 2021

The staff of “Mathematical Analysis” department consists of 11 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

### I. SCIENTIFIC PART

In 2021, according to the affirmed plan, six scientific works on the themes of “Modern problems of harmonic analysis” are carried out.

**Work 1:** Application and boundedness of sublinear operators generated by Calderon-Zygmund in weighted Orlicz-Morrey-type spaces.

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

Works on application and boundedness of sublinear operators generated by Calderon-Zygmund in weighted Orlicz-Morrey-type spaces have been carried out. Boundedness of sublinear operators generated by Calderon-Zygmund in local modifier generalized Morrey-type spaces was studied and regularization of first order derivatives of second order divergent elliptic equations in local modifier generalized Morrey-type spaces was investigated. Based on the results of researches, the following papers were published.

1. V.S. Guliyev, M.N. Omarova, M.A. Ragusa, A. Scapellato, Regularity of solutions of elliptic equations in divergence form in modified local generalized Morrey spaces, **Anal. Math. Phys.** 11, No. 13 (2021). (IF-2,056), Q1

<https://link.springer.com/article/10.1007%2Fs13324-020-00433-9>

2. M.N. Omarova, Nonsingular integral on weighted Orlicz spaces, **Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics**, 41 (1), 138-145 (2021). (SCOPUS)

**Work 2: Compactness theorems in variable exponent Morrey on metric measure spaces.**

**Executors:** doct. math. sci., senior researcher Rovshan Bandaliyev., cand. phys. math. sci., ass. prof., lead. res. ass Zaman Safarov

With regards to affirmed plan, necessary and sufficient conditions for set given in variable exponent Morrey on metric measure space evenly were found out in order to be precompact case . For precompact case , additional conditions are required on variable exponent Morrey space contrast to variable exponent Lebesgue space . Obtained results account for Morrey space either.

Moreover, derived necessary and sufficient conditions on monoton weighted functions for boundedness of special type Hausdorff operator on weighted Lebesgue space. Studies on this work are carried out. As the results of researches , the following papers were published.

1. R.A. Bandaliyev, I.G. Mamedov, A.E. Abdullayeva and K.H. Safarova . Optimal control problem for a degenerate fractional differential equation. **Lobachevskii J. Math.**, 42(6), 2021, 1239-1247.(WoS, ESCI)
2. S.G. Hasanov, F.A. İsayev, Z.V. Safarov, Characterizations of Lipschitz functions via commutators generated by parametric Marcinkiewicz integral on generalized Orlicz-Morrey spaces, **Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics**, 41 (1), 98-109 (2021). (SCOPUS)

**Work 3: Logarithmic potentials in over Ahlfors N-regular spaces.**

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

Logarithmic potentials in over Ahlfors N-regular spaces was investigated. The  $L_p$  boundedness of Hardy-Littlewood maximal operator in commutative hipergroups was studied. Studies on this work are carried out.

**Work 4: The two-weighted inequalities for fractional integral generated by Gegenbauer differential operator.**

**Executor:** doct. math. sci., senior researcher Elman Ibrahimov

Works on the two-weighted inequalities for fractional integral generated by Gegenbauer differential operator are carried out. In the first semi-annual, following articles was published.

## **Work 5 : Two-weighted inequalities for the commutator of sublinear operator derived from B-singular integral.**

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

Works on two-weighted inequalities for the commutator of sublinear operator derived from B-singular integral are carried out.

1. S.G. Hasanov, F.A. İsayev, Z.V. Safarov, Characterizations of Lipschitz functions via commutators generated by parametric Marcinkiewicz integral on generalized Orlicz-Morrey spaces, **Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics**, 41 (1), 98-109 (2021). (SCOPUS)

## **İŞ: 6. Modulus of continuity and approximation theorems in weighted Lebesgue spaces.**

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

With regards to affirmed plan, generalized Bernstein-Khloodovsky polynomial operator and two-variable generalized Szasz operator were investigated. For generalized Bernstein-Khloodovsky polynomial operator was proved approximation theorem at bounded interval in positive semi-axis. In positive semi-axis, estimation concerning with weighted modulus of continuity of two-variable generalized Szasz operator was given and right approximation theorem was proved.

In the first semi-annual, following articles was published.

1. A.N. Mammadova, A.E. Abdullayeva. Approximation properties of generalized Szasz and Bernstein-Chloodowsky operators, **Tbilisi Math. J.**, 14(2), 2021, 179-192. (WoS, ESCI)

## **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 17 collaborators. One of them is a professor (corr. member of ANAS), one doctor of sciences (professor of ANAS), 4 associate professor, 4 senior res. ass., 4 res. ass., 2 engineer programmer, 1 senior laboratory assistants, 3 laboratory assistants.

Prof.V.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) while being also member in the editorials board of many international "Journal of Nonlinear Sciences and Applications" (J. Nonlinear Sci. Appl.), "Applied and Computational Mathematics", "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.

Under the management of Prof V.Guliyev as an editor-in-chief, **vol. 41, no. 1, 2021** 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. 41, no 4, 2021** issue of journal are going on.

In the first quarter of annual report **5** articles of departament staff were published, **10** articles were accepted for publication and **14** articles were presented.

**Head of the department**  
**"Mathematical Analysis"**

**Corr. member of NASA,**  
**prof. V.S. GULIYEV**