

About the scientific and scientific organizational activity of the department of "Algebra and Mathematical Logic" for the first semester of 2024

REPORT

In the department, 4 works are performed, 1 in one, and 3 in the other, on 2 topics.

Topic 1. Application of methods of algebra and mathematical logic.

In the first half of the year, the work in the department was carried out as planned. The following work was done on the first topic:

Work 1. Determination of necessary and sufficient conditions for the compactness of the weighted composition operator.

I.r., Ph.D. Eminaga Mammadov, j.r. Vafa Mammadova

X is a certain Hausdorff compact set, $C(X)$ is a Banach algebra of continuous functions, $A = A(X) \subset C(X)$ is a subalgebra, $C(X, A)$ is an algebra of A -valued continuous functions equipped with a $\|h\|_{C(X, A)} = \sup_{x \in X} \|h(x)\|_{C(X)}$ norm, $\varphi: X \rightarrow X$ is a self-mapping, and $u \in C(X, A)$ is a given function. The compactness of the following weighted composition operator is investigated:

$$(T \cdot f)(x) = u(f \circ \varphi)(x), f \in C(X, A), u \in M_{A(X)}, \varphi \in C_{A(X)}$$

The main result is as follows:

Theorem. Let the operator T defined by (3.1) be a compact operator. Then for any compactly connected component $K \subset s_u$ and for any peak set E with respect to $A(X)$, we have either $\varphi(K) \subseteq E$, or $\varphi(K) \cap E = \emptyset$.

Topic 2. Study of the works of Azerbaijani scientists on mathematics and logical sciences.

The following works were done on the second topic:

Work 1. Examining the notes in the second and third articles in N. Tusi's "Editorial Eglidis".

h.d., Ph.D., Ali Babayev, s.r. Valeriya Majlumbayova

Book II (chapter) of Euclid's "Fundamentals" is dedicated to expressing the areas of parallelograms with the areas of other figures of the same size (the area is not a numerical expression, but what part of the plane the figure occupies). The translation of N. Tusi's "Tahriri Eglidis" by Zarinzade was studied. Tusi's interpretation was found to be fundamentally different from Euclid's. Tusi gives the concept of the product of straight line segments. This corresponds to the area of the rectangle built on those pieces. Tusi gave 11 new proofs of the theorems given in this book. The proofs are based on the laws of additivity and distributivity of addition and multiplication operations. These innovations require a reference to the manuscript of Tusi's "Edited Eglidis".

Work 2. Basics and formalization of determining the modality of the results of logical figures that include modal premises.

I.r., Ph.D., Eminaga Mammadov, r. Rana Babayeva

On the basis of chapters 3 and 4 of N. Tusi's work "Tajrid al-mantiq", modal propositions, criteria for their classification, absolute, necessary, possible (potential) modalities and logical figures compiled from them resulting modes, the influence of quantifiers in modal propositions were studied. For example, the proposition "Some A is B - always" can be understood in two ways:

- there is such a fixed, unchanging A that it is always B;
- there is always an A that is B.

It has been shown that the existence quantifier has an effect in such propositions exactly according to method I.

Work 3. Translation and study of theorems 12-19 in N.Tusi's "Commentary on Archimedes' book "Sphere and Cylinder"" from Arabic.

r. Ali Aliyev, s.r., Ph.D. Leyla Sheykhzamanova

During the reporting period, the translation and study of the "Theorems" section of N. Tusi's cities (Hyderabad edition) of Archimedes' treatise "2 books on the Sphere and Cylinder" from Arabic (up to theorem XXV) was continued. In this part of the work, the proportions between the sides and other elements of the polygons drawn inside and outside the spherical geometric figures are discussed.

In the course of proving the theorems, N.Tusi presents his original comments. For example, during the proof of theorem XXIII, he notes that, "I say: the condition that the number of sides is even is clear; this requirement except for the fact that the number of sides of an equilateral polygon is exactly divisible by four, as well as the area drawn (created) by the middle side that bisects the diameter BD" ... condition. This surface is a cylindrical surface. The rest are cones. Isaac does not return to this theorem, which is one of the problems in the book; he calls it (this theorem) a prelude in preparation for what follows. This theorem was introduced to explain the "Provisions".

Scientific organizational works.

At the international conference dedicated to the memory of Nasireddin Tusi, a genius Azerbaijani scientist and thinker who lived in the 13th century, 6 employees of the department will give a report:

1. A.A.Babaev, V.F.Majlumbekova. On the influence on Tusi's works on European mathematical thought.
2. E.M.Mammadov, Y.Sezar. Some remark on laplace equation in grand Lebesgue-Hardy classes.
3. L.A.Sheykhzamanova. Comments by N.Tusi on the work of Archimedes "On the sphere and the cylinder".
4. R.Q.Babayeva, E.M.Mammadov. Some remarks on modal proposals in Tusi's treatise "Tajrid al-mantik".
5. V.M.Mammadova, Z.A.Panahova. Compactness of weighted composition operator.

Works published during the reporting period:

Articles:

1. Mamedov E., Ismailov N. On some structural properties in Banach function spaces. Trans. Nat. Acad. Sci. Azerb. Ser. Phys-tech. Math. Sci. 43(4), 114-127 (2023).
2. Бабаев А.А., Меджлумбекова В.Ф. О геометрических принципах в различных переводных версиях «Начал» Евклида. II Международная конференция Российского национального комитета по истории и философии науки и техники РАН, Москва, 2024 г.
3. Марданов М.Дж., Бабаев А.А. О начале наук в трактате «Асасул-иктибас» Насиреддина Туси. Материалы XVI Всероссийской научной конференции «Современная логика: проблемы и перспективы» Логико-философские штудии Том 21 (2024) № 1–2. Санкт-Петербургский государственный университет 27–29 июня 2024, стр.32-35.

Grant project:

On the Fredholmity of elliptic equations in Grand Sobolev spaces

Head: Mammadov Eminaga

Project number: AEF-MCG-2023-1(43)-13/05/1-M-05

Project implementation period: 01.12.2023-01.12.2025

The following research papers have been submitted to various journals for publication:

1. A.A.Babaev, V.F.Majlumbekova. On the influence on Tusi's works on European mathematical thought. XI Modern problems of Mathematics and Mechanics, Proceedings of the International Conference dedicated to the memory of Nasireddin Tusi, a brilliant Azerbaijani scientist and thinker who lived in the 13th century. Baku, 2024.
2. А.А.Бабаев, М.Дж.Марданов. О начале наук в трактате «Асасул-иктибас» Насиреддина Туси. XVI Всероссийской научной конференции «Современная логика: проблемы и перспективы». Санкт-Петербург, 2024.
3. E.Mamedov, Y.Sezer, N.Nasibova. Some remarks on integral operators in Banch-Sobolev spaces . Azer. Journ. of Math. 2024, N2.
4. E.M.Mammadov, Y.Sezar. Some remark on Laplace equation in grand Lebesgue-Hardy classes. XI Modern problems of Mathematics and Mechanics, Proceedings of the International Conference dedicated to the memory of

- Nasireddin Tusi, a brilliant Azerbaijani scientist and thinker who lived in the 13th century. Baku, 2024.
5. L.A.Sheyxzamanova. Comments by N.Tusi on the work of Archimedes "On the sphere and the cylinder". XI Modern problems of Mathematics and Mechanics, Proceedings of the International Conference dedicated to the memory of Nasireddin Tusi, a brilliant Azerbaijani scientist and thinker who lived in the 13th century. Baku, 2024.
 6. R.Q.Babayeva, E.M.Mammadov. Some remarks on modal proposals in Tusi's treatise "Tajrid al-mantik". XI Modern problems of Mathematics and Mechanics, Proceedings of the International Conference dedicated to the memory of Nasireddin Tusi, a brilliant Azerbaijani scientist and thinker who lived in the 13th century. Baku, 2024.
 7. V.Mammadova, Z.Panahova. "Compactness of the weighted composition operator". Transactions of Pedagogical University. Baku, 2024. (məqalə)
 8. V.Mammadova, Z.Panahova. "Compactness of the weighted composition operator". XI Modern problems of Mathematics and Mechanics, Proceedings of the International Conference dedicated to the memory of Nasireddin Tusi, a brilliant Azerbaijani scientist and thinker who lived in the 13th century. Baku, 2024. (tezis)

In addition to these, under the scientific editorship of Valeriya Majlumbeyova, senior researcher of the department, "Марданов М., Бабаев А. The book "Насиреддин Туси и его математические труды" " is being prepared for publication.

The leading researcher of the department, Eminagha Mammadov, translated Professor Ivan Anatolyevich Malchev's book "Дискретная математика" from Russian into Azerbaijani. The translation is expected to be published soon.

In addition, junior researcher of the department Vafa Mammadova participated as a guest in the following conferences and events:

1. "Heydar Aliyev and science" conference dedicated to the 100th anniversary of Heydar Aliyev at the Child and Youth Development Center No. 5. (07.01.2024)
2. "Towards the Peaks" event dedicated to the end of the 2023/24 academic year within the "Year of Solidarity for the Green World" of Child and Youth Development Center No. 5. (29.05.2024)

Head of department:

A.A. Babayev