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The 6th International Conference "Function Spaces. Differential Operators. Problems of Mathematical Education",

dedicated to the centennial anniversary of the corresponding member of Russian Academy of Sciences, academician of European Academy of Sciences L.D. Kudryavtsev

Moscow, Russia, November 14–19, 2023

ABSTRACTS

Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University)
Steklov Mathematical Institute of Russian Academy of Sciences
Lomonosov Moscow State University

2023

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List of 45-minute Invited Speakers:
S. I. Bezrodnykh, V. I. Bogachev, G. A. Chechkin, G,V. Demidenko, Z. Yu. Fazullin, G. E. Ivanov, S. I. Kabanikhin, A. N. Karapetyants, B. S. Kashin, S. V. Konyagin, M. A. Mkrtchyan, V. E. Nazaikinskii, N. D. Podufalov, S. A. Rozanova, A. L. Semenov, A. A. Shananin, A. A. Shkalikov, D. V. Treschev, S. K. Vodopyanov, A. G. Yagola.

The relevance of L. D. Kudryavtsev's ideas for education in the 21st century

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The report examines the views of Corresponding Member of the Academy of Sciences of the USSR, Professor L. D. Kudryavtsev on higher education and education in general, which are of great relevance today. For L. D. Kudryavtsev, mathematical education was the most important element and type of education, but the principles he developed certainly have a value that goes far beyond the scope of teaching mathematics. In particular, the provisions of Kudryavtsev's pedagogy related to the following issues are considered:

- Attitude of the educational organization and each teacher in relation to the student and learning outcomes.
- Formation of student motivation. The role of positive motivation and encouragement.
- Ability and inability for a particular education. Possibility and necessity of mathematical education for everyone.
- Organization of the educational process. Lectures, practical classes, structure of certification and preparation for it. Independent work of the student, the role of the lecturer and teacher.
- General goals of mathematics teaching and all education. Meta-subject and personal goals. Big ideas.
- The problem of large volume of curriculum content, its proportionality to the capabilities of the student.
- Digital transformation of education.

The continuity of Kudryavtsev's views with the traditions of world and Russian education, in particular, with the works of V. P. Ermakov and A. N. Krylova is discussed. Kudryavtsev also addresses the XIX International Conference on Public Education, convened by UNESCO and IBE in Geneva in 1956 (report by W. Servais) and the vast cultural context, from Dostoevsky to N. Bohr, where he finds confirmation of his views.

Like every major scientist, Prof. L. D. Kudryavtsev, on the one hand, was a man of his time and the social environment of the USSR, a world power, with outstanding achievements in science and technology, primarily in defense. On the other hand, Kudryavtsev's thoughts are absolutely in tune with the humanistic principles of pedagogy, which is possible and necessary for us today. One of the tasks that the speaker sets for himself is to attract the attention of young mathematics teachers to the works of L. D. Kudryavtsev according to the methods of higher education, which is the result of many decades of work by an outstanding professor of mathematics.

References

[1] Kudryavtsev L. D. Modern mathematics and its teaching. With a foreword by P. S. Alexandrov: Textbook for universities. — M.: Nauka, 1985. — 176 p.

Operators, Generated by the First Order Differential Systems

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We shall present in the talk new results on asymptotic representations for the fundamental system of solutions of the equation

$$\mathcal{L} := y' + B(x)y = \lambda A(x)y, \quad x \in [0,1],$$

as $\lambda \to \infty$ in some sectors of the complex plane. Here A and B are $n \times n$ matrices with summable entries and λ is the spectral parameter. We present explicit formulae for the first k terms of the asymptotic expansions under minimal assumptions on the smoothness of the matrices A and B, namely, when the entries of these matrices belong to the Sobolev space $W_1^{k-1}[0,1]$.

Then we study the spectral properties of the operator $A^{-1}\mathcal{L}$, generated by the boundary conditions $U_0 y(0) + U_1 y(1) = 0$. We define the class of the regular boundary value problems and prove that the root functions of the operator $A^{-1}\mathcal{L}$, form an unconditional block-basis in the space $\mathcal{H} = (L_2[0,1])^n$, provided that the regularity condition holds. Applications of these results to the high order scalar ordinary differential operators with distribution coefficients will be presented.

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On existence of solutions to elliptic differential difference equations with essentially nonlinear operators having a semibounded variation

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Let $Q \subset \mathbb{R}^n$ be a bounded domain with a boundary $\partial Q \in C^\infty$, or $Q = (0,d) \times G$, where $G \subset \mathbb{R}^{n-1}$ is a bounded domain (with a boundary $\partial G \in C^\infty$ if $n \geqslant 3$). If $n = 1$ we denote $Q = (0,d)$. We consider the problem with essentially nonlinear operator A

$$ARu(x) = -\sum_{1 \leqslant i \leqslant n} \partial_i A_i(x, Ru(x), \nabla Ru(x)) + A_0(x, Ru(x), \nabla Ru(x)) = f(x), \quad (1)$$