

ABSTRACTS

N.F. Abuzyarova

ON 2-GENERATENESS OF WEAKLY LOCALIZABLE SUBMODULES
IN THE MODULE OF ENTIRE FUNCTIONS OF EXPONENTIAL TYPE
AND POLYNOMIAL GROWTH ON THE REAL AXIS

Abstract. In the work we consider a topological module $\mathcal{P}(a; b)$ of entire functions, which is the isomorphic image of the Schwarz space of distributions with compact supports in a finite or infinite interval $(a; b) \subset \mathbb{R}$ under the Fourier-Laplace transform. We prove that each weakly localizable module in $\mathcal{P}(a; b)$ is either generated by its two elements or is equal to the closure of two submodules of special form. We also provide dual results on subspaces in $C^\infty(a; b)$ invariant w.r.t. the differentiation operator.

Keywords: entire functions, subharmonic functions, Fourier-Laplace transform, finitely generated submodules, description of submodules, local description of submodules, invariant subspaces, spectral synthesis.

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PROPERTIES OF THE RESOLVENT OF THE LAPLACE OPERATOR
ON A TWO-DIMENSIONAL SPHERE AND A TRACE FORMULA

Abstract. In the work we study the properties of the resolvent of the Laplace-Beltrami operator on a two-dimensional sphere S^2 . We obtain the regularized trace formula for the Laplace-Beltrami operator perturbed by the operator of multiplication by a function in $W_2^1(S^2)$.

Keywords: resolvent, kernel, Laplace-Beltrami operator, perturbed operator

I.I. Bavrín, O.E. Yaremko

INVERTING OF GENERALIZED RIEMANN-LIOUVILLE OPERATOR
BY MEANS OF INTEGRAL LAPLACE TRANSFORM

Abstract. We employ the integral Laplace transform to invert the generalized Riemann-Liouville operator in a closed form. We establish that the inverse generalized Riemann-Liouville operator is a differential or integral-differential operator. We establish a relation between Riemann-Liouville operator and Temlyakov-Bavrin operator. We provide new examples of generalized Riemann-Liouville operator.

Keywords: Riemann-Liouville operator, fractional integral, Laplace transform

A.V. Zhiber, S.N. KamaevaCONSTRUCTION OF EXACT SOLUTION TO SINE-GORDON EQUATION
ON THE BASE OF ITS CHARACTERISTIC LIE RING

Abstract. In the work we consider the scheme of constructing exact solutions to the Sine-Gordon equation based on a restricting the characteristic Lie ring. We study in details the case when the dimension of the space formed by commutators of length 6 is equal to 1.

Keywords: solitons, vector fields, Lie ring

L.S. Ibragimova, I.G. Mustafina, M.G. YumagulovTHE ASYMPTOTIC FORMULAE IN THE PROBLEM ON CONSTRUCTING HYPERBOLICITY
AND STABILITY REGIONS OF DYNAMICAL SYSTEMS

Abstract. The paper proposes a new general method allowing one to study the problem on constructing hyperbolicity and stability regions for nonlinear dynamical systems. The method is based on a modification of M. Rozo method for studying the stability of linear systems with periodic coefficients depending on a small parameter and on the asymptotic formulae in the perturbation theory of linear operators. We obtain approximate formulae describing the boundary of hyperbolicity and stability regions. As an example, we provide the scheme for constructing the stability regions for Mathieu equation.

Keywords: hyperbolicity regions, stability regions, dynamical systems, small parameter, asymptotic formula

Kh.K. Ishkin, Kh. Kh. MurtazinASYMPTOTICS FOR THE EIGENVALUES OF A FOURTH ORDER DIFFERENTIAL OPERATOR
IN A «DEGENERATE» CASE

Abstract. In the paper we consider operator L in $L^2[0, +\infty)$ generated by the differential expression $\mathcal{L}(y) = y^{(4)} - 2(p(x)y')' + q(x)y$ and boundary conditions $y(0) = y''(0) = 0$ in the “degenerate” case, when the roots of associated characteristic equation has different growth rate at the infinity. Assuming a power growth for functions p and q under some additional conditions of smoothness and regularity kind, we obtain an asymptotic equation for the spectrum allowing us to write out several first terms in the asymptotic expansion for the eigenvalues of operator L .

Keywords: differential operators, asymptotics of spectrum, turning point.

R.Kh. Karimov, L.M. Kozhevnikova, A.A. KhadzhiBEHAVIOR OF SOLUTIONS TO ELLIPTIC EQUATIONS WITH NON-POWER NONLINEARITIES
IN UNBOUNDED DOMAINS

Abstract. We establish estimates characterizing the decay rate as $|x| \rightarrow \infty$ of solutions to the Dirichlet problems in unbounded domains for a certain class of elliptic equations with non-power nonlinearities.

Keywords: anisotropic elliptic equations, non-power nonlinearity, Sobolev-Orlicz space, unbounded domain.

M.N. Poptsova, I.T. Habibullin

SYMMETRIES AND CONSERVATION LAWS FOR A TWO-COMPONENT DISCRETE POTENTIATED KORTEWEG-DE VRIES EQUATION

Abstract. In the work we discuss briefly a method for constructing a formal asymptotic solution to a system of linear difference equations in the vicinity of a special value of the parameter. In the case when the system is the Lax pair for some nonlinear equation on a square graph, the found formal asymptotic solution allows us to describe the conservation laws and higher symmetries for this nonlinear equation. In the work we give a complete description of a series of conservation laws and the higher symmetries hierarchy for a discrete potentiated two-component Korteweg-de Vries equation.

Keywords: integrable dynamical systems, equation on square graph, symmetries, conservation laws, Lax pair.

A.Yu. Savin, B.Yu Sternin

HOMOTOPY CLASSIFICATION OF ELLIPTIC PROBLEMS ASSOCIATED WITH DISCRETE GROUP ACTIONS ON MANIFOLDS WITH BOUNDARY

Abstract. Given an action of a discrete group G on a smooth compact manifold M with a boundary, we consider a class of operators generated by pseudodifferential operators on M and shift operators associated with the group action. For elliptic operators in this class, we obtain a classification up to stable homotopies and show that the group of stable homotopy classes of such problems is isomorphic to the K -group of the crossed product of the algebra of continuous functions on the cotangent bundle over the interior of the manifold and the group G acting on this algebra by automorphisms.

Keywords: elliptic operator, homotopy classification, K -theory, crossed product, G -operator.

E.A. Sozontova

ON SOLVABILITY BY QUADRATURES CONDITIONS FOR SECOND ORDER HYPERBOLIC SYSTEMS

Abstract. In the present work we consider boundary value problems for second order hyperbolic system with higher partial derivatives u_{xy} , v_{xy} and u_{xx} , v_{yy} . The aim of the study is to find sufficient conditions for solvability of the considered problems by quadratures. We proposed a method for finding explicit solutions for the mentioned problems based on factorization of the equations in the original systems. As a result, in terms of the coefficients of these systems, we obtain 14 conditions for solvability by quadratures for each boundary value problem.

Keywords: hyperbolic system, Goursat problem, boundary value problem, solvability by quadratures, factorization of equation.

B.I. Suleimanov**QUANTUM ASPECTS OF THE INTEGRABILITY OF THE THIRD PAINLEVÉ EQUATION
AND A NON-STATIONARY TIME SCHRÖDINGER EQUATION WITH THE MORSE POTENTIAL**

Abstract. In terms of solutions to isomonodromic deformations equation for the third Painlevé equation, we write out the simultaneous solution of three linear partial differential equations. The first of them is a quantum analogue of the linearization of the third Painlevé equation written in one of the forms. The second is an analogue of the time Schrödinger equation determined by the Hamiltonian structure of this ordinary differential equation. The third is a first order equation with the coefficients depending explicitly on the solutions to the third Painlevé equation. For the autonomous reduction of the third Painlevé equation this simultaneous solution defines solutions to a time quantum mechanical Schrödinger equation, which is equivalent to a time Schrödinger equation with a known Morse potential. These solutions satisfy also linear differential equations with the coefficients depending explicitly on the solutions of the corresponding autonomous Hamiltonian system. It is shown that the condition of global boundedness in the spatial variable of the constructed solution to the Schrödinger equation is related to determining these solutions to the classical Hamiltonian system by Bohr-Sommerfeld rule of the old quantum mechanics.

Keywords: quantization, linearization, Hamiltonian, nonstationary Schrödinger equation, Painlevé equations, isomonodromic deformations, Morse potential.

B.Kh. Turmetov**ON SOLVABILITY OF A BOUNDARY VALUE PROBLEM FOR AN INHOMOGENEOUS
POLYHARMONIC EQUATION WITH A FRACTIONAL ORDER BOUNDARY OPERATOR**

Abstract. In this paper we study the solvability of one boundary value problem for an inhomogeneous polyharmonic equation. As a boundary operator, we consider a differentiation operator of fractional order in the Hadamard sense. The considered problem is a generalization of the known Neumann problem.

Keywords: polyharmonic equation, fractional derivative, Neumann problems, Hadamard operators.