

## ABSTRACTS

M.A. Gatsunaev, A.A. Klyachin

ON UNIFORM CONVERGENCE OF PIECEWISE-LINEAR SOLUTIONS TO MINIMAL SURFACE EQUATION

**Abstract.** In the paper we consider piecewise-linear solutions of the minimal surface equation over a given triangulation of a polyhedral domain. It is shown that under certain conditions, the gradients of these functions are bounded as the maximum diameter of the triangles of the triangulation tends to zero. It is stressed that this property holds if the piecewise-linear function approximate the area of the graph of a smooth function with the required accuracy. An implication of the obtained properties is the uniform convergence of piecewise linear solutions to the exact solution of the minimal surface equation.

**Keywords:** : piecewise-linear functions, minimal surface equation, the approximation of the area functional

O.A. Ivanova, S.N. Melikhov

ON A.F. LEONT'EV'S INTERPOLATING FUNCTION

**Abstract.** We introduce and study an abstract version of an interpolating functional. It is defined by means of Pommiez operator acting in an countable inductive limit of weighted Fréchet spaces of entire functions and of an entire function of two complex variables. The properties of the corresponding Pommiez operator are studied. The A.F.Leont'ev's interpolating function used widely in the theory of exponential series and convolution operators and as well as the interpolating functional applied earlier for solving the problem on the existence of a continuous linear right inverse to the operator of representation of analytic functions on a bounded convex domain in  $\mathbb{C}$  by quasipolynomial series are partial cases of the introduced interpolating functional.

**Keywords:** A.F.Leont'ev's interpolating function, interpolating functional, Pommiez operator

A.V. Karpikova

ASYMPTOTICS FOR EIGENVALUES OF STURM-LIOUVILLE OPERATOR WITH PERIODIC BOUNDARY CONDITIONS

**Abstract.** We employ the similar operators method for studying the spectral properties of the Sturm–Liouville operator generated by the differential expression  $l(y) = -y'' - vy$  with a complex potential  $v$  and periodic boundary conditions  $y(0) = y(2\pi)$ ,  $y'(0) = y'(2\pi)$ . We obtain the results on the asymptotics for the spectrum of the operator.

**Keywords:** similar operators method, Sturm–Liouville operator, the spectrum of operator, asymptotics for the spectrum.

## Yu.A. Kordyukov, V.A. Pavlenko

### SINGULAR INTEGRAL OPERATORS ON A MANIFOLD WITH A DISTINGUISHED SUBMANIFOLD

**Abstract.** Let  $X$  be a compact manifold without boundary and  $X^0$  be its smooth submanifold of codimension one. In the work we introduce classes of integral operators on  $X$  with kernels  $K_A(x, y)$  being smooth functions for  $x \notin X^0$  and  $y \notin X^0$  and having an asymptotic expansion of certain type if  $x$  or  $y$  approaches  $X^0$ . For the operators in these classes we prove theorems on action in the spaces of conormal functions and composition theorems. We show that the trace functional can be extended to a regularized trace functional  $r\text{-Tr}$  defined on some algebra  $\mathcal{K}(X, X^0)$  of singular integral operators described above. We prove a formula for the regularized trace of the commutator of operators from this class in terms of associated operators on  $X^0$ . The proofs are based on theorems on pull-back and push-forward of conormal functions under maps of manifolds with distinguished codimension one submanifolds.

**Keywords:** manifolds, singular integral operators, conormal functions, regularized trace, pull-back, push-forward

## A.R. Manapova, F.V. Lubyshev

### ACCURACY ESTIMATE WITH RESPECT TO STATE OF FINITE-DIMENSIONAL APPROXIMATIONS FOR OPTIMIZATION PROBLEMS FOR SEMI-LINEAR ELLIPTIC EQUATIONS WITH DISCONTINUOUS COEFFICIENTS AND SOLUTIONS

**Abstract.** In the work we consider nonlinear optimal control problems for semilinear elliptic equations with discontinuous coefficients and solutions with control in the conjugation boundary conditions. We construct difference approximations for extremum problems and obtain the estimates for approximation accuracy with respect to the state.

**Keywords:** optimal control problem, semi-linear elliptic equations, difference method of solving

## A.V. Neklyudov

### BEHAVIOR OF SOLUTIONS TO GAUSS-BIEBERBACH-RADEMACHER EQUATION ON PLANE

**Abstract.** We study the asymptotic behavior at infinity of solutions to Gauss-Bieberbach-Rademacher equation  $\Delta u = e^u$  in the domain exterior to the circle on the plane. We establish that the leading term of the asymptotics is a logarithmic function tending to  $-\infty$ . We also find the next-to-leading term for various values of the coefficient in the leading term.

**Keywords:** Semilinear elliptic equations, Gauss-Bieberbach-Rademacher equation, asymptotic behavior of solutions.

**B.N. Khabibullin**

## HELLY'S THEOREM AND SHIFTS OF SETS. I

**Abstract.** The motivation for the considered geometric problems is the study of conditions under which an exponential system is incomplete in spaces of the functions holomorphic in a compact set  $C$  and continuous on this compact set. The exponents of this exponential system are zeroes for a sum (finite or infinite) of families of entire functions of exponential type. As  $C$  is a convex compact set, this problem happens to be closely connected the Helly's theorem on the intersection of convex sets in the following treatment. Let  $C$  and  $S$  be two sets in the finite-dimensional Euclidean space being respectively intersections and unions of some subsets. We give criteria for some parallel translation (shift) of set  $C$  to cover completely (respectively, to contain or to intersect) set  $S$ . These and similar criteria are formulated in terms of geometric, algebraic, and set-theoretic differences of subsets generating  $C$  and  $S$ .

**Keywords:** Helly's theorem, incompleteness of exponential systems, convexity, shift, geometric, algebraic, and set-theoretic differences