

## Abstracts

**2010 MSC.** Primary 30C62, 31A05, 31A20, 31A25, 31B25, 35Q15;  
Secondary 30E25, 31C05, 34M50, 35F45

E. S. Afanas'eva, V. I. Ryazanov, R. R. Salimov. **To the theory of mappings of the Sobolev class with the critical index** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 154–176.

It is established that any homeomorphism  $f$  of the Sobolev class  $W_{\text{loc}}^{1,1}$  with outer dilatation  $K_O(x, f) \in L_{\text{loc}}^{n-1}$  is the so-called lower  $Q$ -homeomorphism with  $Q(x) = K_O(x, f)$  and also a ring  $Q$ -homeomorphism with  $Q(x) = K_O^{n-1}(x, f)$ . This allows us to apply the theory of boundary behavior of ring and lower  $Q$ -homeomorphisms. In particular, we have found the conditions imposed on the outer dilatation  $K_O(x, f)$  and the boundaries of domains under which any homeomorphism of the Sobolev class  $W_{\text{loc}}^{1,1}$  admits continuous or homeomorphic extensions to the boundary.

References. 49

**2010 MSC.** 32A10, 32A40, 32A60

A. I. Bandura, O. B. Skaskiv. **Partial logarithmic derivatives and distribution of zeros of analytic functions in the unit ball of bounded  $\mathbf{L}$ -index in joint variables** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 177–193.

We obtain the sufficient conditions of boundedness of  $\mathbf{L}$ -index in joint variables for analytic functions in the unit ball, where  $L : \mathbb{C}^n \rightarrow \mathbb{R}_+^n$  is a continuous positive vector-function. They give an estimate of the maximum modulus of an analytic function by its minimum modulus on a skeleton in a polydisc and describe the behavior of all partial logarithmic derivatives outside some exceptional set and the distribution of zeros. The deduced results are also new for analytic functions in the unit disc of bounded index and  $l$ -index. They generalize known results by G. H. Fricke, M. M. Sheremeta, A. D. Kuzyk, and V. O. Kushnir.

References. 37

**2010 MSC.** 42B99

S. O. Chaichenko, A. L. Shydlich. **Approximative characteristics of modular Orlicz spaces** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 194–209.

We obtain the exact values of the best approximations, basic widths and Kolmogorov widths for some sets of images of multipliers in the modular Orlicz spaces  $l_M$ . We give a description of the space  $S_{M,N}$  of all multipliers from the space  $l_M$  to  $l_N$ .

References. 30

**2000 MSC.** Primary 35C99; Secondary 32W50

T. Kolomiets, A. Pogorui, R. M. Rodríguez-Dagnino. **Solution of systems of partial differential equations by using properties of monogenic functions on commutative algebras** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 210–219.

Some systems of differential equations with partial derivatives are studied by using the properties of Gâteaux differentiable functions on commutative algebras. The connection between solutions of systems of partial differential equations and components of monogenic functions on the corresponding commutative algebras is shown. We also give some examples of systems of partial differential equations and find their solutions.

References. 8

**2010 MSC.** 35G15

Z. M. Nytrebych, V. S. Il'kiv, P. Ya. Pukach, O. M. Malanchuk. **Differential-symbol method of constructing the quasipolynomial solutions of a two-point problem for a partial differential equation** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 220–236.

We studied the solvability of a problem with local inhomogeneous conditions two-point in time for a homogeneous differential equation which is second-order in time and has generally the infinite order in spatial variables in the case where the set of zeros of the characteristic determinant of the problem is not empty and does not coincide with  $\mathbb{C}^s$ . The existence of a solution of the problem under the condition that the right-hand sides of the two-point conditions are quasipolynomials is proved. A differential-symbol method of constructing a solution of the problem is proposed.

References. 26

**2010 MSC.** 2GA33, 46E30, 35A31

A. M. Najafov, A. M. Gasimova. **On properties of functions from Lizorkin–Triebel–Morrey type spaces** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 237–250.

We have introduced new functional spaces of the Lizorkin–Triebel–Morrey type, and a Sobolev-type inequality is proved. We have also shown that the generalized derivatives of functions from this spaces satisfy the generalized Hölder condition.

References. 17

**2010 MSC.** Primary 35R30; Secondary 35M33, 46E35

L. Pestov, D. Strelnikov. **Approximate controllability of the wave equation with mixed boundary conditions** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 251–263.

We consider initial boundary-value problem for acoustic equation in the time space cylinder  $\Omega \times (0, 2T)$  with unknown variable speed of sound, zero initial data, and mixed boundary conditions. We assume that (Neumann) controls are located at some part  $\Sigma \times [0, T]$ ,  $\Sigma \subset \partial\Omega$  of the lateral surface of the cylinder  $\Omega \times (0, T)$ . The domain of observation is  $\Sigma \times [0, 2T]$ , and the pressure on another part  $(\partial\Omega \setminus \Sigma) \times [0, 2T]$  is assumed to be zero for any control. We prove the approximate boundary controllability for functions from the subspace  $V \subset H^1(\Omega)$  whose traces have vanished on  $\Sigma$  provided that the observation time is  $2T$  more than two acoustic radii of the domain  $\Omega$ . We give an explicit procedure for solving Boundary Control Problem (BCP) for smooth harmonic functions from  $V$  (i.e., we are looking for a boundary control  $f$  which generates a wave  $u^f$  such that  $u^f(\cdot, T)$  approximates any prescribed harmonic function from  $V$ ). Moreover, using the Friedrichs–Poincaré inequality, we obtain a conditional estimate for this BCP. Note that, for solving BCP for these harmonic functions, we do not need the knowledge of the speed of sound.

References. 13

**2010 MSC.** 53A05, 53B21, 53B30, 53B35, 53C22

L. Rýparová, J. Mikeš, A. Sabykanov. **On geodesic bifurcations of product spaces** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 264–271.

The bifurcation is described as a situation where there exist at least two different geodesics going through the given point in the given direction. In the previous works, the examples of local and closed bifurcations are constructed. This paper is devoted to the further study of these bifurcations. We construct an example of  $n$ -dimensional (pseudo-) Riemannian and Kählerian spaces which are product ones that admit a local bifurcation of geodesics and also a closed geodesic.

References. 6

**2010 MSC.** 30G35, 57R35

V. S. Shpakivskiy. **On monogenic functions defined in different commutative algebras** // Ukrainian Mathematical Bulletin, **15** (2018), No. 2, 272–294.

The correspondence between a monogenic function in an arbitrary finite-dimensional commutative associative algebra and a finite collection of monogenic functions in a special commutative associative algebra is established.

References. 21