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4. *A. Dzhalilov, M. Salmi Md Noorani, and S. Akhatkulov.* On Critical Circle Homeomorphisms with Infinite Number of Break Points, Hindawi Publishing Corporation, Abstract and Applied Analysis. Volume 2014, Article ID 378742, 6 pages http://dx.doi.org/10.1155/2014/378742)

Pairwise Lindelцf Bitopological Spaces and Their Product Properties

[1] **Zabidin Salleh**

[1] *Department of Applied Mathematics, Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*
e-mail: zabidin@umt.edu.my

A bitopological space (X, τ_1, τ_2) is a set X together with two (arbitrary) topologies ?$_1$ and ?$_2$ defined on X. The first significant investigation into bitopological setting was launched by Kelly in 1963. He recognized that by relaxing the symmetry condition on pseudo-metrics, two topologies were induced by the resulting quasi-pseudo-metrics. Furthermore, Kelly extended some of the standard results of separation axioms in a topological space to a bitopological space. Some such extensions are pairwise regular, pairwise Hausdorff and pairwise normal spaces. There are several works dedicated to the investigation of bitopologies; most of them deal with the theory itself but very few with applications. In this research, we are concerned with the ideas of pairwise Lindelцfness in bitopological spaces motivated by the known ideas of Lindelцfness in topological spaces. There are four types of pairwise Lindelцf bitopological space, namely Lindelцf, B-Lindelцf, s-Lindelцf, and p-Lindelцf spaces that depend on the open, i-open, τ_1, τ_2-open and p-open covers, respectively introduced by Reilly in 1973, and Fora and Hdeib in 1983. For instance, a bitopological space X is said to be p-Lindelцf if every p-open cover of X has a countable subcover. Some characterizations of these pairwise Lindelцf bitopological spaces are studied. The relations among them are studied and some counterexamples are given in order to prove that the generalizations studied are proper generalizations of Lindelцf topological spaces. Subspaces and subsets of these spaces are also studied, and some of their characterizations are investigated. We show that some subsets of these spaces inherit these pairwise Lindelцf properties and some others, do not. The productivity of these pairwise Lindelцf spaces are also studied. It is well known by the Tychonoff Product Theorem that compactness and pairwise compactness are preserved under products. We show by means of counterexamples that in general the pairwise Lindelцfness are not preserved under finite products. We give some necessary conditions, for example the P-space property; under which these spaces become finitely productive. Some contributions on other related areas are also discussed.

The Cauchy integral formula for the class of H_A^1 functions.

[1]**Zhabborov Nasriddin**, [2]**Husenov Behzod**

[1] *Joint Belarusian-Uzbek Intersectoral Institute of Applied Technical Qualifications in Tashkent, Tashkent, Uzbekistan,*
e-mail: jabborov61@mail.ru

[2] *Bukhara State University, Bukhara, Uzbekistan,*
e-mail: husenovbehzod@mail.ru

Let $A(z)$ be an antianalytic function, i. e. $\frac{\partial A}{\partial z} = 0$ in the domain $D \subset \mathbb{C}$; moreover, let $|A(z)| \leq C < 1$ for all $z \in D$. The function $f(z)$ is said to be $A(z)-$analytic in the domain D if for any $z \in D$, the following equality holds:

$$\frac{\partial f}{\partial \bar{z}} = A(z)\frac{\partial f}{\partial z} \quad (1)$$

We denote by $O_A(D)$ the class of all $A(z)-$analytic functions defined in the domain D.

According to, the function

$$\psi(z;a) = z - a + \overline{\int\limits_{\gamma(a;z)} \overline{A(\tau)}d\tau}$$

is an $A(z)-$analytic function.

The following set is an open subset of D :

$$L(a;r) = \left\{ |\psi(z;a)| = \left| z - a + \overline{\int\limits_{\gamma(a;z)} \overline{A(\tau)}d\tau} \right| < r \right\}$$

For sufficiently small $r > 0$, this set compactly lies in D (we denote this fact by $L(a;r) \subset\subset D$) and contains the point a. This set $L(a;r)$ is called the $A(z)-$lemniscate centered at the point ζ. The lemniscate $L(a;r)$ is a simply - connected set (see [4]).

The Hardy class $H_A^p, p > 0$ for $A(z)$-analytic functions is given in [5]. Before we will introduce this class for $A(z)$-analytic functions in the case $p = 1$.

Definition 1. *$f(z) \in O_A(L(a;R))$ is said to be in H_A^1, if*

$$\frac{1}{2\pi R} \int\limits_{|\psi(z;a)|=R} |f(z)||dz + A(z)d\bar{z}| \tag{3}$$

is bounded in lemniscate $L(a;R)$.

Classes H^p were introduced by F. Riesz's. They first proved the convergence theorem of this class of functions in 1923.

Statement 1. *If $f(z)$ is a function from class H_A^1, then*

$$\lim_{z\to\zeta} \frac{1}{2\pi R} \int\limits_{|\psi(z;a)|=R} |f(z) - f(\zeta)||d\zeta + A(\zeta)d\bar{\zeta}| = 0, \tag{4}$$

where $\zeta \in \partial L(a;R)$.

Now we give the Cauchy integral formula for the class of functions H_A^1.

Theorem 1. *Let $D \subset \mathbb{C}$ is an arbitrary convex domain and $L(a;R) \subset D$ is a lemniscate. For the functions $f(z)$ from the Hardy class $H_A^1(L(a;R))$ the Cauchy formula*

$$f(z) = \int\limits_{\partial L(a;R)} K(\zeta;z)f(\zeta)(d\zeta + A(\zeta)d\bar{\zeta}), \quad z \in L(a;R), \tag{5}$$

is valid.

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Разрешимость нелокальной задачи для волнового уравнения дробного порядка

[1]Адил Н., [2]Бердышев А.С.,[3]Эшматов Б.Э.

[1] *Казахский Национальный Педагогический университет имени Абая, Казахстан,*
e-mail: nauryzbai_adil@mail.ru

[2]*Казахский Национальный Педагогический университет имени Абая, Казахстан*
e-mail: berdyshev@mail.ru

[3]*Каршинский инженерно-экономический университет, Узбекистан*
e-mail: eshmatovb@mail.ru

Рассмотрим уравнение

$$Lz(x,y)=\begin{cases} {}_cD_{0x}^{\alpha}z(x,y)-z_{yy}(x,y), & (x,y)\in\Omega_0 \\ z_{xx}(x,y)-z_{yy}(x,y), & (x,y)\in\Omega_1 \end{cases} ,1<\alpha<2 \tag{1}$$

$\Gamma(x)$ - гамма-функция Эйлера, ${}_cD_{0x}^{\alpha}z(x,y)$ - интегро-дифференциальный оператор дробного порядка α в смысле Капуто, в области $\Omega=\Omega_0\cup\Omega_1\cup AB$.

Здесь Ω_0 -прямоугольник ABB_0A_0 с вершинами $A\,(0,0)\,, B\,(1,0)\,, B_0\,(1,1)\,, A_0\,(0,1)\,,\ \Omega_1$ - область, ограниченная отрезками AB и характеристиками $AC: x+y=0, BC: x-y=1$ уравнения (1), $f(x,y)$ -заданная функция. Пусть гладкая кривая $AD: y=-\gamma\,(x)\,,\ 0<x<l,$ где $0,5<l\le 1;\ \gamma\,(0)=0,\ l+\gamma\,(l)=1$,если $l<1$ если и $\gamma(l)=0$, если $l=1$, если расположена внутри характеристического треугольника $0<x+y\le x-y<1$.

Относительно кривой $\gamma\,(x)$, предположим, что $\gamma\,(x)$ - дважды непрерывно дифференцируемая функция и n $x\pm\gamma\,(x)$ - монотонно возрастающие функции, причем $0<\gamma'(x)<1$, $\gamma(x)>0,\ x>0$.

Задача 1. Найти решение уравнения(1), удовлетворяющее условиям:

$$z(0,y)=0,\ 0\le y\le 1\,, \tag{2}$$

$$z(x,1)=0,\ 0\le x\le 1, \tag{3}$$

$$[z_x-z_y]\,[\theta_0\,(t)]+\mu\,(t)\,[z_x-z_y]\,[\theta^*\,(t)]=0,\ 0<t<1, \tag{4}$$

где $\theta_0\,(t)\,, (\theta^*\,(t))$ аффикс точки пересечения характеристики AC (кривой AD) с характеристикой выходящей из точки $(t,0), 0<t<1, \mu\,(t)$ - заданная функция.

В случае когда $\alpha=1$ регулярная, сильная разрешимость, а также вольтерровость **Задачи 1.** Изучены в [1], [2]. В работе при определенных ограничениях на данные задачи доказана однозначная разрешимость сформулированной задачи.

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