



QARSHI DAVLAT
UNIVERSITETI



**ANALIZNING
ZAMONAVIY
MUAMMOLARI**

2023
2-3 Iyun

Qarshi shahri
2023-yil

RESPUBLIKA MIQYOSIDAGI
ILMIY KONFERENSIYA
MATERIALI



**O‘ZBEKISTON RESPUBLIKASI
OLIIY TA’LIM, FAN VA INNOVATSIYALAR
VAZIRLIGI**

QARSHI DAVLAT UNIVERSITETI

ANALIZNING ZAMONAVIY MUAMMOLARI

Respublika ilmiy anjumani materiallari

2-3 iyun 2023-yil

СОВРЕМЕННЫЕ ПРОБЛЕМЫ АНАЛИЗА

**Материалы республиканской научной
конференции**

2-3 июнь 2023 года

June 2-3, 2023.

MODERN PROBLEMS OF ANALYSIS

Materials of the republican scientific conference

Qarshi-2023



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Theorem. For the operator W_1 the following statements are true:

- i) the set $M_1 = \{x \in S^2 : x_1 = x_2\}$ is invariant set;
- ii) $\text{Fix}(W_0) = \begin{cases} \{e_3\}, & \text{if } \alpha \leq -1/2, \\ \{e_3, x_\alpha^*\}, & \text{if } \alpha > -1/2, \end{cases}$ where $x_\alpha^* = \left(\frac{1-x_\alpha^*}{2}, \frac{1-x_\alpha^*}{2}, x_\alpha^*\right)$;
- iii) $W_0(x^{(0)}) = e_3$ for any $x^{(0)} \in \{e_1, e_2, e_3\}$;
- iv) if $x^{(0)} \in S^2 \setminus \{e_1, e_2, e_3\}$ then $\omega_{W_0}(x^{(0)}) = \begin{cases} \{e_3\}, & \text{if } \alpha \leq -1/2, \\ \{x_\alpha^*\}, & \text{if } \alpha > -1/2. \end{cases}$

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PUASSON INTEGRAL FORMULASINING ANALOGI

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Annotatsiya. Ushbu maqolada $G \subset D$ soha lemniskata bo'lib, uning chegarasi ∂G da uzluksiz $A(z)$ – garmonik funksiyalar uchun Dirixle masalasining eng sodda yechimi sifatida Puasson formulasi analogi olingan.

Ma'lumki klassik holdagi Puasson formulasi garmonik funksiyalar uchun Dirixli masalasining eng sodda yechimlaridan biri bo'ladi. Biz bu yerda $A(z)$ – garmonik funksiyalar sinfi uchun Dirixli masalasini qaraymiz [1-5].

Aytaylik $G \subset D$ soha lemniskata bo'lib, uning chegarasi ∂G da uzluksiz funksiya berilgan bo'lsin.

Ana shu G lemniskatada $A(z)$ – garmonik, \bar{G} da uzluksiz bo'lgan shunday $u(z) \in h_A(G) \cap C(\bar{G}) : u|_{\partial G} = \varphi$ funksiya topilsinki, ∂G da $u(z)$ funksiya $\varphi(z)$ funksiya bilan ustma-ust tushsin $u(z)|_{\partial G} = \varphi(z)$.

Teorema. $A(z)$ -garmonik funksiya uchun Puasson formulasining analogi). Agar $\varphi(\xi)$ funksiya $L(a, R) \subset D$ lemniskatada uzluksiz bo'lsa, u holda ushbu

$$u(z) = \frac{1}{2\pi R} \oint_{|\varphi(a, \xi)|=R} \varphi(\xi) \frac{R^2 - |\psi(a, z)|^2}{|\psi(a, z)|^2} |d\xi + A(\xi) d\bar{\xi}| \quad (1)$$

funksiya $L(a, R)$ da Dirixli masalasini yechimi bo'ladi.

Isbot. Quyidagi yordamchi



$$f(\xi, z) = \frac{\psi(a, \xi) + \psi(a, z)}{\psi(z, \xi)}$$

funksiyani qaraymiz, Bu yerda $z \in L(a, R)$, $\xi \in \partial L(a, R)$. Ravshanki $f(\xi, z)$ funksiya $A(z)$ – analitik funksiya bo'ladi. Shuning uchun

$$\Pi(\xi, z) = \frac{1}{2\pi} \operatorname{Re} f(\xi, z)$$

funksiya $L(a, R)$ da $A(z)$ – garmonik bo'ladi. Shuningdek, $\operatorname{Re} f(\xi, z)$ ni f va \bar{f} ifodasidan foydalanib

$$\begin{aligned} \Pi(\xi, z) &= \frac{1}{2\pi} (f(\xi, z) + \overline{f(\xi, z)}) = \frac{1}{2\pi} \left[\frac{\psi(a, \xi) + \psi(a, z)}{\psi(z, \xi) - \psi(a, z)} + \frac{\overline{\psi(a, \xi) + \psi(a, z)}}{\overline{\psi(z, \xi) - \psi(a, z)}} \right] = \\ &= \frac{1}{2\pi} \left[\frac{|\psi(a, \xi)|^2 - |\psi(a, z)|^2}{|\psi(z, \xi)|^2} \right] = \frac{1}{2\pi} \left[\frac{R^2 - |\psi(a, z)|^2}{|\psi(z, \xi)|^2} \right] \end{aligned} \quad (2)$$

Bo'lishini topamiz. Demak, $u(z)$ funksiya $L(a, R)$ da $A(z)$ – garmonik ekan. $u(z) \in h_A[L(a, R)]$.

Endi $u(z)$ ni $\overline{L(a, R)}$ da uzluksiz va $u(z)|_{\partial L} = \varphi(\xi)$ bo'lishini ko'rsatamiz.

Buning uchun quyidagi dalillardan foydalanamiz:

$$1) \frac{1}{2\pi R} \int_{|\psi(\xi, z)|=R} \frac{R^2 - |\psi(a, z)|^2}{|\psi(z, \xi)|^2} [d\xi + A(\xi) d\bar{\xi}] = 1$$

2) $z_0 \in \partial L(a, R)$, $\xi = \xi_0$ uchun $z \rightarrow \xi_0$ da har qanday $\gamma_\delta = \partial L(a, R) \setminus U(\xi, \delta)$ yoyda $\Pi(\xi, z)$ funksiya 0 ga tekis yaqinlashadi. $\Pi(\xi, z) \rightarrow 0$, agar $z \rightarrow \xi_0$, $\xi = \xi_0$.

Deylik $\psi(a, \xi) = Re^{\mu}$ bo'lsin. U holda

$$|dz + A d\bar{z}| = \left| \frac{\partial \psi}{\partial z} dz + \frac{\partial \psi}{\partial \bar{z}} d\bar{z} \right| = |d\psi(\xi, a)| = |dR e^{\mu}| = |Rie^{\mu} dt| = R dt$$

va

$$\frac{1}{2\pi R} \int_{|\psi(\xi, z)|=R} \varphi(\xi) \frac{R^2 - |\psi(a, z)|^2}{|\psi(z, \xi)|^2} [d\xi + A(\xi) d\bar{\xi}] = \frac{1}{2\pi} \int_0^{2\pi} \varphi(\xi) \frac{R^2 - |\psi(a, z)|^2}{|\psi(z, \xi)|^2} d$$

bo'ladi.

FOYDALANILGAN ADABIYOTLAR RO'YXATI

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ANALITIK GRAFIK USTIDA ANIQLANGAN GOLOMORF FUNKSIYALAR UCHUN VEIL INTEGRAL FORMULASI

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Annotatsiya: Ushbu tadqiqot ishida kompleks fazodagi analitik funksiyaning grafigi ustida aniqlangan golomorf funksiyalar uchun maxsus poliedrda Veil integral formulasi o'rganiladi.

Butun funksiya grafigidan iborat kompleks ko'pxillik ustida golomorf funksiyalarning integral formula orqali chegaraviy qiymatlar orqali tiklanishi masalasini qaraylik. Shteyn ko'pxilliklarida global integral formulalar G.Henkin va J.Leiterer[1] monografiyasida batafsil yoritiladi. Shuningek, analitik to'plamlar ustida bu kabi formulalar T.E.Hatziafratis[2] tomonidan ham o'rganilgan va bir muncha sodda ko'rinishga keltiriladi. Biz ushbu ishda yanada sodda holda ya'ni grafik ustida formula ko'rinishini o'rganib chiqamiz.

$$\mathbb{C}^{n+1} = \mathbb{C}_z^n \times \mathbb{C}_w \text{ fazoda } \Gamma = \{(z_1, \dots, z_n, w) \in \mathbb{C}^{n+1} : z \in \mathbb{C}_z^n, w = \varphi(z)\}$$

analitik grafikni qaraymiz. Bu yerda $\varphi(z) = \varphi(z_1, z_2, \dots, z_n)$ funksiya \mathbb{C}_z^n kompleks fazoda aniqlangan butun funksiyadan iborat. Biz $\mathbb{C}^{n+1} = \mathbb{C}_z^n \times \mathbb{C}_w$ fazoda aniqlangan $g_1(z, w), g_2(z, w), \dots, g_N(z, w)$ ($N > n$) golomorf funksiyalar olib, ushbu

$$\Pi = (z, w) \in \Gamma : |g_1(z, w)| < 1, \dots, |g_N(z, w)| < 1$$

poliedrni aniqlaymiz. Har bir tayinlangan $J = (j_1, j_2, \dots, j_n)$, $1 \leq j_1 < j_2 < \dots < j_n \leq N$ indekslar nabori uchun

$$e_j = (\xi, \eta) \in \Pi : |g_{j_1}(\xi, \eta)| = |g_{j_2}(\xi, \eta)| = \dots = |g_{j_n}(\xi, \eta)| = 0$$

to'plamlarga poliderning ostovlari deyiladi. $\partial\Pi = \bigcup_j e_j$ topologik chegara deyiladi.

Agar poliedrning ostovlari n o'lchami bo'lakli silliq ko'pxilliklardan iborat bo'lsa unga grafik ustidagi Veil poliedri deymiz. Bizga quyida tushunchalar kerak bo'ladi Ushbu yoyilmalar

$$\varphi(z) - \varphi(\xi) = \sum_{k=1}^n \varphi_k(\xi, z)(\xi_k - z_k)$$