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

MIRZO ULUG‘BEK NOMIDAGI O‘ZBEKISTON MILLIY UNIVERSITETINING JIZZAX FILIALI

RAQAMLI JAMIYATDA FAN VA TA’LIMNING INTEGRATSIYALALASHUVI: MATEMATIKA, IQTISOD, PEDAGOGIKA VA PSIXOLOGIYANING YANGI YONDASHUVLARI

mavzusidagi Respublika ilmiy-texnik anjuman materiallari to‘plami

(2026-yil 20-21-aprel)

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Raqamli jamiyatda fan va ta’limning integratsiyalalashuvi: matematika, iqtisod, pedagogika va psixologiyaning yangi yondashuvlari. Respublika ilmiy-texnik anjuman materiallari to‘plami – Jizzax: O‘zMU Jizzax filiali Amaliy matematika kafedrasi, 2026-yil 20-21-aprel 505-bet.

Respublika miqyosidagi ilmiy-texnik anjuman materiallarida zamonaviy kompyuter ilmlari va muhandislik texnologiyalari sohasidagi innovatsion tadqiqotlar aks etgan.

Globallashuv sharoitida davlatimizni yanada barqaror va jadal sur’atlar bilan rivojlantirish bo‘yicha amalga oshirilayotgan islohotlar samarasini yaxshilash sohasidagi ilmiy-tadqiqot ishlariga alohida e’tibor qaratilgan. Zero iqtisodiyotning, ijtimoiy sohalarni qamrab olgan modernizatsiya jarayonlari, hayotning barcha sohalarini liberallashtirishni talab qilmoqda.

Ushbu ilmiy ma’ruza tezislari to‘plamida mamlakatimiz va xorijlik turli yo‘nalishlarda faoliyat olib borayotgan mutaxassislar, olimlar, professor-o‘qituvchilar, ilmiy tadqiqot institutlari va markazlarining ilmiy xodimlari, tadqiqotchilari, magistr va talabalarning ilmiy-tadqiqot ishlari natijalari mujassamlashgan.

Mazkur to‘plamga kiritilgan ma’ruza tezislarining mazmuni, undagi statistik ma’lumotlar va me’yoriy hujjatlarning to‘g‘riligi hamda tanqidiy fikr-mulohazalar, keltirilgan takliflarga mualliflarning o‘zlari mas’uldirlar.

$$a_r := \lim_{z\to e_{\max}+} a(z),\ \ b_r := \lim_{z\to e_{\max}+} b(z),\ \ c_r := a_r^2 - b_r^2.$$

$$\kappa_r = \lim_{z\to 2d+} \kappa_r(z),\ \ \nu_r = \lim_{z\to 2d+} \nu_r(z)$$

Let Γ_r be graph of the parabola $P_{e_{\max}}(\lambda,\mu)=0$ in the $\lambda\mu$–plane. It divides the (λ,μ) plane into two disjoint parts

$$G_0^r = \{(\lambda,\mu): P_{e_{\max}}(\lambda,\mu) > 0\},\ G_1^r = \{(\lambda,\mu): P_{e_{\max}}(\lambda,\mu) < 0\}.$$

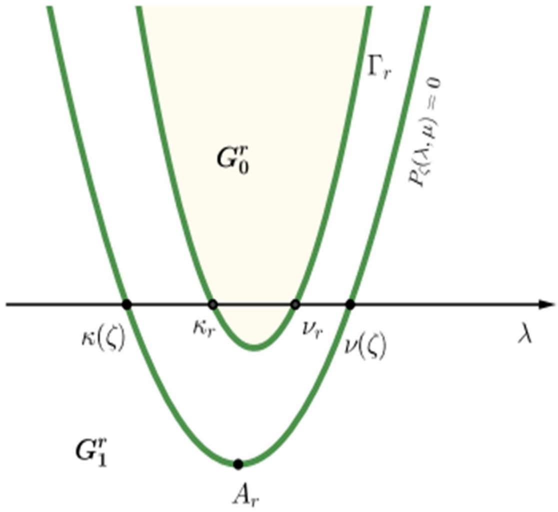

Figure : Location of $P_\zeta(\lambda,\mu)=0$, $\zeta > e_{\max}$.

Theorem 1.

(a) For $(\lambda,\mu)\in G_0^r \cup \Gamma_r$, *the operator* $H_{\lambda\mu}$ *has no eigenvalues in* $[e_{\max},\infty)$.

(b) For $(\lambda,\mu)\in G_1^r$, *the operator* $H_{\lambda\mu}$ *has a simple eigenvalue in* $[e_{\max},\infty)$.

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CHEBYSHEV KO‘PHADLARI ORQALI FUNKSIYALARNI YAQNLASHTIRISH

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Funksiyalarni yaqinlashtirish masalasi matematik analiz va sonli metodlarning asosiy yo‘nalishlaridan biri hisoblanadi. Amaliy hisoblashlarda murakkab yoki analitik ifodasi qiyin funksiyalarni soddalashtirilgan ko‘phadlar orqali ifodalash hisoblash samaradorligini oshiradi va xatoliklarni kamaytiradi. Chebyshev ko‘phadlari maksimal xato mezoni bo‘yicha eng yaxshi yaqinlashtirish natijasini taqdim etadi.

Chebishev ko‘phadlari elementlari bo‘lgan $T_n(x)$ funksiyalar (ko‘phadlar) $[-1,1]$ oraliqda o‘zaro ortogonaldir. $w_1(x) = \frac{1}{\sqrt{1-x^2}}$ va $w_2(x) = \sqrt{1-x^2}$ vazn funksiyalari yordamida bu elementlarning koeffisiyentlari topib olinadi. Eng optimal yaqinlashtirish xossasi Chebishev qatorlari orqali funksiyalarni taqribiy hisoblashda qo‘l keladi. Ayniqsa, bu ko‘phadlar yordamida qurilgan interpolatsion ko‘phadlar klassik usullarga nisbatan ancha barqaror bo‘ladi. Chebishev ko‘phadlari ortoganal ko‘phadlar oilasiga mansub bo‘lib, ular matematik analizda keng qo‘llaniladi. Chebishev ko‘phadlari ikkita turga bo‘linadi:

1. Birinchi tur Chebishev ko‘phadlari: $T_n(x)$ quyidagi rekurrent formula orqali aniqlanadi.

$$T_0(x) = 1, \quad T_1(x) = x, \quad T_{n+1}(x) = 2xT_n(x) - T_{n-1}(x), \qquad n \geq 1.$$

Shuningdek, ushbu ko‘phadlarni trigonometriya orqali ifodalash mumkin:

$$T_n(x) = cos(n\, cos^{-1}(x)), \quad |x| \leq 1.$$

Funksiyalarni Chebishev ko‘phadlari orqali yaqinlashtirish Chebishev ko‘phadlarining chiziqli kombinatsiyasi ko‘rinishida ifodalanadi.

$$P_n(x) = a_0T_0(x) + a_1T_1(x) + a_2T_2(x) + \ldots + a_nT_n(x). \qquad (9)$$

a_n-koeffitsiyentlar quyidagi formula bilan aniqlanadi:

$$a_0 = \frac{1}{\pi}\int_{-1}^{1} f(x) \cdot \frac{1}{\sqrt{1-x^2}}dx,$$

$$a_k = \frac{2}{\pi}\int_{-1}^{1} f(x) \cdot T_k(x) \cdot \frac{1}{\sqrt{1-x^2}}dx, \qquad (n = 1,2,\ldots).$$

Gauss-Chebishev integrali – bu Chebishev vazn funksiyasi asosida tuzilgan Gauss-Chebishsev kvadratura formulasi.Bu integralning asosi shundan iboratki, $[-1,1]$ oraliqda Chebishev ko‘phadlariga moslashtirilgan vazn funksiyalariga ega integrallarni taqribiy hisoblash uchun ishlatiladi. Agar $f(x)$ funksiya silliq bo‘lsa, u holda n ta nuqtali Gauss-Chebishev kvadraturasi quyidagicha bo‘ladi.

$$\int_{-1}^{1} \frac{f(x)}{\sqrt{1-x^2}}dx \approx \frac{\pi}{n}\sum_{i=1}^{n} f(x_i);$$

Chebishev ko‘phadlari $T_n(x)$ uchun ildizlar − 1 va 1 oralig‘ida berilib, ular quyidagicha bo‘ladi:

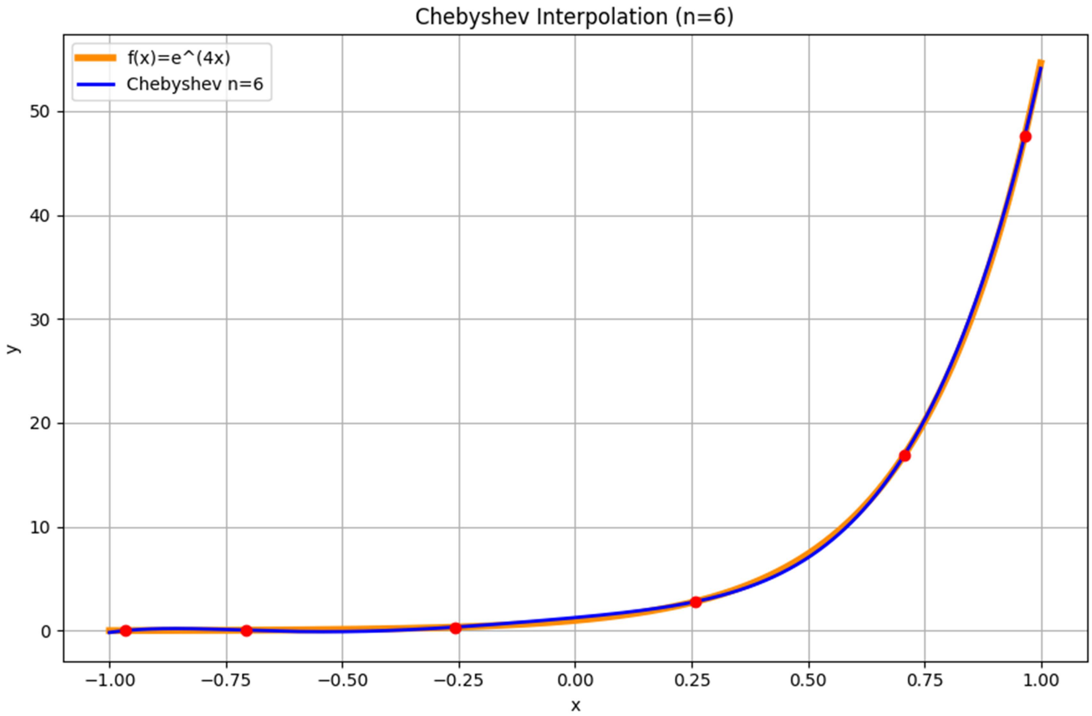
$$x_i = cos\left(\frac{2i-1}{2n}\pi\right), \qquad (i = 1,2,\ldots,n);$$

Misol 1. $f(x) = e^{4x}$ *funksiya uchun* $n = 6$ *da birinchi tur Chebishev ko‘phadini tuzing.*

$a_0 \approx 11{,}986 \quad a_1 \approx 19{,}99 \quad a_2 \approx 8{,}01 \quad a_3 \approx 2{,}67 \quad a_4 \approx 0{,}68 \quad a_5 \approx 0{,}089$

$$P_5(x) = 11{,}986 + 19{,}99T_1(x) + 8{,}01T_2(x) + 2{,}67T_3(x) + 0{,}68T_4(x) + 0{,}089T_5(x)$$

$$P_5(x) \approx 1 + 4x + 8x^2 + 10{,}6667x^3 + 10{,}567x^4 + 8{,}5333x^5$$



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SHARTLI BOG’LIQ BO’LMAGAN TASODIFIY MIQDORLAR UCHUN BA’ZI TENGSIZLIKLAR.

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Abstract: This article investigates fundamental inequalities for sequences of conditionally independent random variables and vectors, which is one of the current directions in probability theory. In particular, analogs of A.N. Kolmogorov and Hajek-Renyi inequalities are presented and proven for random vectors with finite moments of order $r > 0$ relative to the sub-sigma algebra mathcal $\mathcal{F}_1$.

The paper obtains upper bounds for the supremum of sums of random variables using the concepts of conditional expectation and conditional variance. Furthermore, the conditions for the