



International
Scientific Conference



Algebraic and Geometric Methods of Analysis



Devoted to 160 anniversary of
Dvytro Grave
(25.08.1863 - 19.12.1939)
Academician of the Ukrainian
Academy of Sciences, the
first director of the Institute of
Mathematics of NAS of Ukraine

May 29 – June 1, 2023
Odesa, Ukraine

LIST OF TOPICS

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric and topological methods in natural sciences
- Geometric problems in mathematical analysis

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then the following inequalities hold

$$\begin{aligned} & \frac{1}{\sqrt{\pi}} e^{-\alpha n^r} \left(1 - \frac{2\gamma_{\alpha,r,n} e^{-2\alpha r(n-1)^{r-1}}}{1 + 2\gamma_{\alpha,r,n} e^{-2\alpha r(n-1)^{r-1}}} \right)^{\frac{1}{2}} \leq P_{2n}(C_{\bar{\beta},2}^{\alpha,r}, C) \\ & \leq P_{2n-1}(C_{\bar{\beta},2}^{\alpha,r}, C) \leq \frac{1}{\sqrt{\pi}} e^{-\alpha n^r} \left(1 + e^{-2\alpha r n^{r-1}} \left(1 + \frac{1}{2\alpha r n^{r-1}} \right) \right)^{\frac{1}{2}}, \end{aligned} \quad (3)$$

where P_N is any of the widths b_N, d_N, λ_N or π_N and

$$\gamma_{\alpha,r,n} = \left(1 + \frac{1}{\alpha r(n-1)^{r-1}} + e^{-2\alpha(n-1)^r} \max \left\{ e^{4\alpha}, \frac{e^2}{\alpha^{1+1/r}} \right\} \right). \quad (4)$$

Theorem 2. Let $\bar{\beta} = \{\beta_k\}_{k=1}^{\infty}, \beta_k \in \mathbb{R}, \alpha > 0, r > 1, n \in \mathbb{N}$ and the condition (2) is satisfied. Then as $n \rightarrow \infty$ the following asymptotic equalities hold

$$\left. \begin{aligned} & P_{2n}(C_{\bar{\beta},2}^{\alpha,r}, C) \\ & P_{2n-1}(C_{\bar{\beta},2}^{\alpha,r}, C) \end{aligned} \right\} = e^{-\alpha n^r} \left(\frac{1}{\sqrt{\pi}} + \mathcal{O}(1) \gamma_{\alpha,r,n} e^{-\alpha r(n-1)^{r-1}} \right), \quad (5)$$

where P_N is any of the widths b_N, d_N, λ_N or π_N and $\gamma_{\alpha,r,n}$ is defined by (4) and $\mathcal{O}(1)$ are the quantities uniformly bounded in all parameters.

Note that the Theorem 2 complements the results of the works of Shevaldin (1992), Stepanets and Serdyuk (1995), Serdyuk (1999), Serdyuk and Sokolenko (2011), Serdyuk and Bodenchuk (2013), which contain exact estimates for the widths of the classes of convolutions with classical or generalized Poisson kernels.

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Poincaré-Reeb graphs of real algebraic domains

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An *algebraic domain* is a closed topological subsurface of a real affine plane whose boundary consists of disjoint smooth connected components of real algebraic plane curves. We study the geometric shape of an algebraic domain by collapsing all vertical segments contained in it:

this yields a *Poincaré–Reeb graph*, which is naturally transversal to the foliation by vertical lines. We show that any transversal graph whose vertices have only valencies 1 and 3 and are situated on distinct vertical lines can be realized as a Poincaré–Reeb graph.

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On univalent trinomials

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The Suffridge polynomials were introduced by T. Suffridge [1] and play an important role in complex analysis. Suffridge polynomials are closely related to the Brandt polynomials, first mentioned in M. Brandt’s Ph.D. thesis [2] and rediscovered in [3].

The T -folded version of these polynomials were suggested in [4, 5] and several important conjectures about them were made.

In this talk we will outline the proof of these conjectures in the particular case of trinomials

$$z + az^{1+T} + bz^{1+2T}.$$

A beautiful geometry behind the scenes will be illuminated.

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