

1985

1985-1. Examine the singularities on the boundary of the space of fundamental systems of solutions to n -th order linear ordinary differential equations.

1985-2. Examine the singularities on the boundary of the space of Chebyshev systems of functions.

1985-3. Study the topological properties of the stability boundary of n -th order linear ordinary differential equations and of the graph of increment.

1985-4. Given the equation

$$u_t + (uv)_x = \varepsilon u_{xx}, \quad v \text{ is a potential field,}$$

on the circle $x \bmod 2\pi$, investigate the eigenfunctions of this equation with the eigenvalues close to zero, as $\varepsilon \rightarrow 0$ (also study the case of a multivalued potential).

1985-5. Given a contact structure (say, the standard one) on \mathbb{S}^3 and a curve being a Legendrian knot of a certain type. How many characteristic chords of the knot are ensured (for an arbitrary contact form)?

1985-6. Transfer the Ragsdale conjecture to singularity theory (express the right-hand sides of the Ragsdale-type inequalities for Morsifications of a singularity in terms of the invariants of the singularity rather than in terms of degree). *Even for $x^n + y^n$, a new theory is obtained because of upper deformations.*

1985-7. Prove theorems on the stabilization of various objects: the cohomology rings of complements of bifurcation diagrams (in \mathbb{C} and \mathbb{R} ?), the multiplicities of strata adjacency, the increment, the boundary of hyperbolicity, Vassiliev's complex of strata, etc.

1985-8. Develop \mathbb{R} - and \mathbb{C} -theories of vanishing inflections (and flattenings).

1985-9. Give an axiomatic description of the Poisson structures arising from mappings of periods of general forms (even for A_μ): a) determine the ranks (e. g., the Lagrangian property) on tangent spaces of various strata of discriminants, b) classify all Poisson structures with given ranks. *The example of a usual swallowtail in \mathbb{C}^3 has been cleared up.*

1985-10. Is it true that the singularities of the hyperbolicity boundary include the singularities of the ellipticity boundary (at least stably)?

1985-11. How is the informal complexification of the notion of orientation related to the spinor structures?

1985-12. Are the Picard–Fuchs equations Hamiltonian with respect to some natural symplectic structure, and do they possess a positive Lagrangian responsible for some kind of non-oscillatory behavior?

1985-13. Can the awful formulae of representation theory (Klebsch–Gordan coefficients, etc.) be simplified by the aid of the theory of convex polyhedra? *Volumes of sections and numbers of lattice points in them are expressed in an equally complicated way via, say, equations of faces or coordinates of vertices of a polyhedron, but conceptually these are simple objects. Maybe one will feel easier if awful formulae are replaced with these simple geometric constructs. In particular—what is the geometry of the $6j$ -symbol (it is nonzero if a tetrahedron can be formed with 6 lengths): won't integer volumes appear there?*

1985-14. Develop the theory of uniform estimates for both oscillatory and exponential multidimensional integrals (Laplace's method) depending generically on parameters.

1985-15. Create either a symplectic or a contact version of Shcherbak's theory of H_3 and H_4 , bypassing an obstacle being replaced in it with a general symplectic construction (similar to the way R. B. Melrose interpreted the billiard problem).

1985-16. Rewrite the Jacobi formulae of the theory of elliptic coordinates for the infinite-dimensional case (assuming that the spectrum is discrete and the axes lengths have the asymptotics required for the series to converge).

1985-17. Is the preservation of the intersection form of a singularity of a function under the stabilizing addition of four squares related to the Bott 8-periodicity? *(Under the stabilization, an 8-fold suspension of the Milnor fiber occurs.)*

1985-18. Study the behavior of the mixed Hodge structures under superpositions of algebraic functions.

1985-19. Is the moment map which sends an n -tuple of points $x_1 \leq x_2 \leq \dots \leq x_n$ with given masses $m_i > 0$ into the n -tuple of momenta $M_k = \sum_i m_i x_i^k$ ($k = 1, 2, \dots, n$) a homeomorphism of a convex polyhedron onto its image?

1985-20. Homotopy classification of nondegenerate homogeneous vector fields of fixed degree: how many connected components does this space have? *For example, cubic fields in \mathbb{R}^3 : What is the maximal index of such vector fields?*

1985-21. Does the Courant theorem on the zeros of the n -th eigenfunction of the Laplace operator admit a complexification (provided that the values are complex and the zeros do not divide the space)?

1985-22. Investigate the topology of the Maxwell set of simple real and complex singularities; is there a stabilization of cohomology rings of complements?

1985-23. How many Whitney cusped singularities does a generic mapping $S^2 \rightarrow S^2$ of degree n necessarily have?

1985-24. Let an open swallowtail lying in a discriminant (either as a multiple self-intersection or as an $A_{\approx n/2}$ stratum) be Lagrangian in some symplectic structure. Classify the extensions of these structures over the entire discriminant.

1985-25. How is the stratification of the univalence boundary in the space of holomorphic mappings of the disk to the plane organized? Have the strata of small codimensions and the bifurcation diagrams been described?

1985-26. J. M. Ball's conjecture: Consider the pyramid inside the swallowtail,

$$\left\{ x^{n+1} + a_1 x^{n-1} + \dots + a_n = \prod_{i=1}^{n+1} (x - x_i), x_i \in \mathbb{R} \right\} \subset \mathbb{R}^n.$$

Restrict it by the condition $|a_1| \leq 1$. Then for any two points of the bounded domain obtained, there is a curve of length less than Cd (d being the distance between points in \mathbb{R}^n) connecting these points inside the domain, where the constant C is independent of the points.

More generally: How can one describe the semialgebraic sets possessing such property of pseudoconvexity (called the *Whitney property*)?