

SINGULARITIES OF CAUSTICS AND WAVE FRONTS

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Singularities Of Caustics And Wave Fronts

Andrej Bona, Michael A Slawinski



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Singularities of Caustics and Wave Fronts Vladimir Arnold, 2001-11-30 One service mathematics has rendered the Et moi si j'avait su comment en revenir human race It has put common sense back je n'y serais point aile Jules Verne where it belongs on the topmost shelf next to the dusty canister labelled discarded non The series is divergent therefore we may be sense Erie T Bell able to do something with it O Heavieside Mathematics is a tool for thought A highly necessary tool in a world where both feedback and non linearities abound Similarly all kinds of parts of mathematics serve as tools for other parts and for other sciences Applying a simple rewriting rule to the quote on the right above one finds such statements as One service topology has rendered mathematical physics One service logic has rendered computer science One service category theory has rendered mathematics All arguably true And all statements obtainable this way form part of the raison d'être of this series Singularities of Caustics and Wave Fronts Vladimir Igorevič Arnol'd, 1990 Singularities of Caustics and Wave Fronts Vladimir Igorevič Arnol'd, 1990

Singularities of Functions, Wave Fronts, Caustics and Multidimensional Integrals Vladimir Igorevich Arnol'd, Aleksandr Nikolaevich Varchenko, A. B. Givental', A. G. Khovanskii, 2012 This classic paper is an introduction to some difficult contemporary fields of study in mathematics known under the rubric of Catastrophe Theory which encompasses the theory of typical singularities of functions and mappings The authors discuss the basic ideas concepts and methods of the theory of singularities The survey is presented in three sections Section 1 Singularities of Functions Caustics and Wave Fronts Section 2 Integrals of the Stationary Phase Method Section 3 The Geometry of Formulas The survey provides a useful source of reference for students postgraduates and researchers in these areas of mathematics

Arnold's Problems Vladimir I. Arnold, 2004-06-24 Vladimir Arnold is one of the most outstanding mathematicians of our time Many of these problems are at the front line of current research **Wavefronts and Rays as Characteristics and Asymptotics** Andrej Bøna, Michael A. Slawinski, 2011 This textbook incorporated with many illuminating examples and exercises is aimed at graduate students of physical sciences and engineering The purpose is to provide a background of physics and underlying mathematics for the concept of rays filling the gap between mathematics and physics textbooks for a coherent treatment of all topics The authors emphasis and extremely good presentation of the theory of characteristics which defines the rays accentuate the beauty and versatility of this theory To this end the rigour of the formulation by a pure mathematician's standards is downplayed to highlight the physical meaning and to make the subject accessible to a wider audience The authors describe in detail the theory of characteristics for different types of differential equations the applications to wave propagation in different types of media and the phenomena such as caustics *Computer Graphics*, 2014-05-19 The decades of the 1970s and 1980s were a very exciting period of discovery in the field of computer graphics It was a time when new rendering algorithms different modeling strategies clever animation techniques and significant advances in photorealism were being made Complementing these software developments hardware systems were dominated

by raster technology and programmers had access to excellent workstations on which to develop their graphics systems In the 1990s incredible advances in computer graphics are far surpassing developments made during the last twenty years Yesterdays computer graphics have given way to todays virtual reality This volume brings together contributions from international experts on the diverse yet important range of topics that impact the design and application of virtual environments Topics covered include 3 D modeling new approaches to rendering virtual environments recent research into the problems of animating and visualizing virtual environments applications for virtual reality systems and simulation of complex behaviors Computer Graphics Developments in Virtual Environments provides a unique opportunity to examine current practice and expert thinking It is essential reading for students practitioners researchers or anyone else who wishes to find out more about this exciting area Provides comprehensive coverage of the latest topics in computer graphics virtual reality and humancomputer interaction Contributors are international experts in the field Examines many real world applications in a wide variety of fields

Wavefronts And Rays As Characteristics And Asymptotics (Third Edition) Andrej Bona, Michael A Slawinski, 2020-09-24 Characteristics and asymptotics of partial differential equations play an important role in mathematical physics since they lead to insightful solutions of complex problems that might not be solvable otherwise They constitute however a difficult subject and the purpose of this book with its additions and refinements that led to its third edition is to present this subject in an accessible manner without decreasing the rigor As any method characteristics and asymptotics have their limitations This important issue is addressed in the last chapter where we discuss caustics which must be understood in applications of the method and which constitute a fertile ground for further mathematical research The book is both a research reference and a textbook Its careful and explanatory style which includes numerous exercises with detailed solutions makes it an excellent textbook for senior undergraduate and graduate courses as well as for independent studies Six appendices are provided which form a self contained course on applied mathematics and can be used as a textbook on its own

Singularities of Differentiable Maps, Volume 1 V.I. Arnold, S.M. Gusein-Zade, Alexander N. Varchenko, 2012-05-24 Singularity theory is a far reaching extension of maxima and minima investigations of differentiable functions with implications for many different areas of mathematics engineering catastrophe theory and the theory of bifurcations and science The three parts of this first volume of a two volume set deal with the stability problem for smooth mappings critical points of smooth functions and caustics and wave front singularities The second volume describes the topological and algebro geometrical aspects of the theory monodromy intersection forms oscillatory integrals asymptotics and mixed Hodge structures of singularities The first volume has been adapted for the needs of non mathematicians presupposing a limited mathematical background and beginning at an elementary level With this foundation the book s sophisticated development permits readers to explore more applications than previous books on singularities

Differential Geometry From A Singularity Theory Viewpoint Shyuichi Izumiya, Maria Del Carmen Romero Fuster, Maria Aparecida Soares

Ruas, Farid Tari, 2015-10-29 Differential Geometry from a Singularity Theory Viewpoint provides a new look at the fascinating and classical subject of the differential geometry of surfaces in Euclidean spaces. The book uses singularity theory to capture some key geometric features of surfaces. It describes the theory of contact and its link with the theory of caustics and wavefronts. It then uses the powerful techniques of these theories to deduce geometric information about surfaces embedded in 3, 4, and 5 dimensional Euclidean spaces. The book also includes recent work of the authors and their collaborators on the geometry of sub manifolds in Minkowski spaces.

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