

REMARKS ON THE METRIC INDUCED BY THE ROBIN FUNCTION

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ABSTRACT. Let D be a smoothly bounded pseudoconvex domain in \mathbb{C}^n , $n > 1$. Using $G(z, p)$, the Green function for D with pole at $p \in D$ associated with the standard sum-of-squares Laplacian, N. Levenberg and H. Yamaguchi had constructed a Kähler metric (the so-called Λ -metric) using the Robin function $\Lambda(p)$ arising from $G(z, p)$. The purpose of this article is to study this metric by deriving its boundary asymptotics and using them to calculate the holomorphic sectional curvature along normal directions. It is also shown that the Λ -metric is comparable to the Kobayashi (and hence to the Bergman and Carathéodory metrics) when D is strongly pseudoconvex. The unit ball in \mathbb{C}^n is also characterized among all smoothly bounded strongly convex domains on which the Λ -metric has constant negative holomorphic sectional curvature. This may be regarded as a version of Lu-Qi Kong's theorem for the Bergman metric.

1. INTRODUCTION

Let D be a smoothly bounded domain in \mathbb{C}^n , $n > 1$ with smooth defining function $\psi(z)$ so that $D = \{\psi < 0\}$. For $p \in D$, let $G(z, p)$ be the Green function for D with pole at p associated to the standard Laplacian

$$\Delta = 4 \sum_{j=1}^n \frac{\partial^2}{\partial z_j \partial \bar{z}_j}$$

on $\mathbb{C}^n \approx \mathbb{R}^{2n}$. The notation for the Green function will be enhanced to $G_D(z, p)$ if the need to emphasize its dependence on D arises. Then $G(z, p)$ is the unique function satisfying $\Delta G(z, p) = 0$ on $D \setminus \{p\}$, $G(z, p) \rightarrow 0$ as $z \rightarrow \partial D$ and $G(z, p) - |z - p|^{-2n+2}$ is harmonic near p . Let $H_p(z)$ be harmonic on D , continuous on \overline{D} and such that $H_p(z) = -|z - p|^{-2n+2}$ for $z \in \partial D$. The existence of such a function is guaranteed by the solution to the Dirichlet problem and

$$G(z, p) = |z - p|^{-2n+2} + H_p(z)$$

is then the Green function for D with pole at p . Therefore

$$\Lambda(p) := \lim_{z \rightarrow p} (G(z, p) - |z - p|^{-2n+2})$$

exists for each $p \in D$ and is called the Robin constant at p and the map $p \mapsto \Lambda(p)$ is the Robin function for D . Said differently $\Lambda(p) = H_p(0)$. Hence it is possible to rewrite the expression for $G(z, p)$ as

$$(1.1) \quad G(z, p) = |z - p|^{-2n+2} + \Lambda(p) + h_p(z)$$

where $h_p(z) = H_p(z) - H_p(0)$ is harmonic on D and satisfies $h_p(p) = 0$ for all $p \in D$. The maximum principle implies that $\Lambda(p) < 0$ for all $p \in D$ and it was shown by Yamaguchi in [13] that $p \mapsto -\Lambda(p)$ is a real analytic exhaustion function for D . The assertion that $\Lambda(p)$ is real analytic is entirely local and as such does not require any smoothness hypothesis on ∂D while the latter statement that $-\Lambda(p)$ is an exhaustion only needs the domain to be one where the Dirichlet problem can be solved. These claims are therefore valid on a much larger class of bounded domains than the smoothly bounded ones, the point here of course being that the smoothness assumption on ∂D does not play any vital role so far. Further understanding of the Robin function came through the work of Levenberg-Yamaguchi ([10]) where they derived explicit expressions for the complex Hessians of $-\Lambda$ and $\log(-\Lambda)$ on smoothly bounded domains using the technique of variation of domains. To describe this briefly, fix $p_0 \in D$ and $a \in \mathbb{C}^n$ a non-zero

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The Metric Induced By The Robin Function

L Darling-Hammond

The Metric Induced By The Robin Function:

The Metric Induced by the Robin Function Norman Levenberg, Hiroshi Yamaguchi, 1991 This paper continues Yamaguchi's earlier work on the Robin function for bounded domains in bold C italic superscript n Yamaguchi showed that if the domain italic D is smoothly bounded and pseudoconvex then the Robin function and its logarithm are both real analytic strongly pseudoconvex exhaustions of the domain It follows that they may be used as potentials to define K hler metrics on the domain In this paper the authors study the properties of these K hler metrics concentrating on the question of completeness By using an affine scaling technique to blow up the domain at points near the boundary the scaling constant grows roughly as the inverse of the distance to the boundary the authors study in some detail the behaviour of the Robin function and the induced metric near the boundary of the domain They show that if the domain is either strongly pseudoconvex or geometrically convex then the metric associated to the logarithm of the Robin function is complete They also conjecture that this is true in general for any smoothly bounded pseudoconvex domain *Theory and Applications of Holomorphic Functions on Algebraic Varieties over Arbitrary Ground Fields* Oscar Zariski, 1951

Kernel Functions,

Analytic Torsion, and Moduli Spaces John David Fay, 1992 This memoir is a study of Ray Singer analytic torsion for hermitian vector bundles on a compact Riemann surface italic C The torsion is expressed through the trace of a modified resolvent Thus one can develop perturbation curvature formulae for the Green Szeg kernel and also for the torsion in terms of the Ahlfors Bers complex structure of the Teichmuller space and Mumford complex structure of the moduli space of stable bundles of degree zero on italic C

Coarse Cohomology and Index Theory on Complete Riemannian Manifolds John

Roe, 1993 July 1993 volume 104 number 497 fourth of 6 numbers *Essays on Geometry* A. Muhammed Uludağ, Ayberk Zeytin, 2025-01-27 The book is a comprehensive compilation of diverse articles delving into various intriguing topics within the realm of geometry Each article is refereed by prominent researchers in the field The book contains research articles offering valuable insights and original results making it a valuable resource for researchers in the field as well as survey articles that review current developments and list open problems

L2 Approaches in Several Complex Variables Takeo Ohsawa, 2018-11-28 This monograph presents the current status of a rapidly developing part of several complex variables motivated by the applicability of effective results to algebraic geometry and differential geometry Special emphasis is put on the new precise results on the L2 extension of holomorphic functions in the past 5 years In Chapter 1 the classical questions of several complex variables motivating the development of this field are reviewed after necessary preparations from the basic notions of those variables and of complex manifolds such as holomorphic functions pseudoconvexity differential forms and cohomology In Chapter 2 the L2 method of solving the d bar equation is presented emphasizing its differential geometric aspect In Chapter 3 a refinement of the Oka Cartan theory is given by this method The L2 extension theorem with an optimal constant is included obtained recently by Z B ocki and separately by Q A Guan and X Y Zhou In Chapter 4 various results on

the Bergman kernel are presented including recent works of Maitani Yamaguchi Berndtsson Guan Zhou and Berndtsson Lempert Most of these results are obtained by the L2 method In the last chapter rather specific results are discussed on the existence and classification of certain holomorphic foliations and Levi flat hypersurfaces as their stables sets These are also applications of the L2 method obtained during the past 15 years Imbeddings of Three-Manifold Groups Francisco González-Acuña,Wilbur Carrington Whitten,1992 This paper deals with the two broad questions of how 3 manifold groups imbed in one another and how such imbeddings relate to any corresponding lowercase Greek Pi1 injective maps In particular we are interested in 1 determining which 3 manifold groups are no cohopfian that is which 3 manifold groups imbed properly in themselves 2 determining the knot subgroups of a knot group and 3 determining when surgery on a knot italic K yields a lens or lens like space and the relationship of such a surgery to the knot subgroup structure of lowercase Greek Pi1 italic S3 italic K Our work requires the formulation of a deformation theorem for lowercase Greek Pi1 injective maps between certain kinds of Haken manifolds and the development of some algebraic tools

Deformation Quantization for Actions of

\$R^d\$ Marc Aristide Rieffel,1993 This work describes a general construction of a deformation quantization for any Poisson bracket on a manifold which comes from an action of R d on that manifold These deformation quantizations are strict in the sense that the deformed product of any two functions is again a function and that there are corresponding involutions and operator norms Many of the techniques involved are adapted from the theory of pseudo differential operators The construction is shown to have many favorable properties A number of specific examples are described ranging from basic ones such as quantum disks quantum tori and quantum spheres to aspects of quantum groups

Geometric Complex Analysis Jisoo Byun,Hong Rae Cho,Sung Yeon Kim,Kang-Hyurk Lee,Jong-Do Park,2018-09-08 The KSCV Symposium the Korean Conference on Several Complex Variables started in 1997 in an effort to promote the study of complex analysis and geometry Since then the conference met semi regularly for about 10 years and then settled on being held biannually The sixth and tenth conferences were held in 2002 and 2014 as satellite conferences to the Beijing International Congress of Mathematicians ICM and the Seoul ICM respectively The purpose of the KSCV Symposium is to organize the research talks of many leading scholars in the world to provide an opportunity for communication and to promote new researchers in this field

Brownian Motion on Nested Fractals Tom Lindstrøm,1990 Lindstrom U of Oslo constructs Brownian motion on a reasonably general class of self similar fractals He deals with diffusions self similar fractals fractal Laplacians asymptotic distribution of eigenvalues nonstandard analysis Annotation copyright Book News Inc Portland Or Complex Analysis and Digital Geometry Mikael Passare,2009 Hokkaido Mathematical Journal ,1996 Mathematical Reviews ,1998

Notices of the American Mathematical Society American Mathematical Society,1991 Sūgaku Expositions ,2000

Annales Scientifiques de L'École Normale Supérieure ,2008 **The Proceedings of the Fourth Conference on Hypercubes, Concurrent Computers, and Applications: Software, applications** ,1989 American Book Publishing

Record ,1992 The Cumulative Book Index ,1992 A world list of books in the English language Green's Functions.
Spectral Invariants, and a Positive Mass on Spheres Jean Steiner,2003

The Metric Induced By The Robin Function Book Review: Unveiling the Magic of Language

In a digital era where connections and knowledge reign supreme, the enchanting power of language has become much more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is really remarkable. This extraordinary book, aptly titled "**The Metric Induced By The Robin Function**," written by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound affect on our existence. Throughout this critique, we will delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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Table of Contents The Metric Induced By The Robin Function

1. Understanding the eBook The Metric Induced By The Robin Function
 - The Rise of Digital Reading The Metric Induced By The Robin Function
 - Advantages of eBooks Over Traditional Books
2. Identifying The Metric Induced By The Robin Function
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an eBook The Metric Induced By The Robin Function
 - User-Friendly Interface
4. Exploring eBook Recommendations from The Metric Induced By The Robin Function
 - Personalized Recommendations
 - The Metric Induced By The Robin Function User Reviews and Ratings
 - The Metric Induced By The Robin Function and Bestseller Lists

5. Accessing The Metric Induced By The Robin Function Free and Paid eBooks
 - The Metric Induced By The Robin Function Public Domain eBooks
 - The Metric Induced By The Robin Function eBook Subscription Services
 - The Metric Induced By The Robin Function Budget-Friendly Options
6. Navigating The Metric Induced By The Robin Function eBook Formats
 - ePUB, PDF, MOBI, and More
 - The Metric Induced By The Robin Function Compatibility with Devices
 - The Metric Induced By The Robin Function Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of The Metric Induced By The Robin Function
 - Highlighting and Note-Taking The Metric Induced By The Robin Function
 - Interactive Elements The Metric Induced By The Robin Function
8. Staying Engaged with The Metric Induced By The Robin Function
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers The Metric Induced By The Robin Function
9. Balancing eBooks and Physical Books The Metric Induced By The Robin Function
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection The Metric Induced By The Robin Function
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine The Metric Induced By The Robin Function
 - Setting Reading Goals The Metric Induced By The Robin Function
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of The Metric Induced By The Robin Function
 - Fact-Checking eBook Content of The Metric Induced By The Robin Function
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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Scholastic Metaphysics: A Contemporary Introduction Edward Feser is Associate Professor of Philosophy at Pasadena City College in Pasadena, California, USA. His many books include Scholastic Metaphysics: A ... Scholastic Metaphysics: A

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