

Titles and Abstracts

China - Korea Joint Seminar on Number Theory

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CAI Li

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Title: Explicit Gross-Zagier formula and Waldspurger formula

Abstract: Based on the work of Yuan-Zhang-Zhang, we obtain an explicit form of Gross-Zagier formula and Waldspurger formula. These explicit formulae are in a very general situation and there is no any restriction on ramification. This is joint work with Jie Shu and Ye Tian.

CHOI Dohoon

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Title: Congruences for weakly holomorphic modular forms

Abstract: In this talk, I will talk about special congruences for weakly holomorphic modular forms. Weakly holomorphic modular forms mean that they are modular forms but can have poles at some cusps. These modular forms have played important roles as generating functions for several objects such as the partition function, traces of singular moduli and so on. This talk will discuss on special congruences concerning with weakly holomorphic modular forms, which are motivated from congruences for the partition function studied by Ramanujan.

FANG Jiangxue

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Title: Special L-values of abelian t-modules

Abstract: In this talk, we prove a formula for the infinity-adic special L-value of abelian t-module(which can be viewed as an analogy of abelian varieties). This formula gives function field analogy of the class number formula. We also express it in terms of the extension groups of shtukas.

GAO Hui

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Title: Potential Diagonalizability of Crystalline Representations

Abstract: Let K_0 be a finite unramified extension of \mathbb{Q}_p . We show that all crystalline representations of G_{K_0} (the absolute Galois group of K_0) with Hodge-Tate weights in $\{0, \dots, p-1\}$ are potentially diagonalizable. This is joint work with Tong Liu.

IM Bo-Hae

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Title: The zeros of certain weakly holomorphic Drinfeld modular forms and quasi-modular forms

Abstract: Duke and Jenkins constructed a canonical basis for the space of weakly holomorphic modular forms for $SL_2(\mathbb{Z})$ and investigated the zeros of the basis elements. In this talk, we give an analogy in the Drinfeld setting of the result given by Duke and Jenkins. Also we give a location of zeros of certain quasi-modular forms for $\Gamma_0^+(N)$. This is a joint work with SoYoung Choi.

JIN Seohko

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Title: On the sign changes for modular forms

Abstract: The sign change problem for the Fourier coefficients (or Hecke eigenvalues) has been well studied. We will review the history for a while and give some new results.

KI Haseo

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Title: On the strong multiplicity one for the Selberg class

Abstract: The strong multiplicity one in automorphic representation theory says that if two automorphic cuspidal irreducible representations on GL_n have isomorphic local components for all but a finite number of places, then they are isomorphic. As the analog of this, the strong multiplicity one for the Selberg class conjectures that for functions F and G with $F(s) = \sum_{n=1}^{\infty} a_F(n)n^{-s}$ and $G(s) = \sum_{n=1}^{\infty} a_G(n)n^{-s}$ in this class, if $a_F(p) = a_G(p)$ for all but finitely many primes p , then $F = G$. In this article, I prove this conjecture.

LEE Jungyun

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Title: Indivisibility of real quadratic function fields

Abstract: We will show that there are infinitely many real quadratic function fields whose class numbers are not divisible by a given prime l . This is a joint work with Yoonjin Lee.

LEE Jun Ho

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Title: On some orders generated by units

Abstract: We introduce known results on fundamental units of some quadratic, cubic, and quartic orders. In this talk, we make a close investigation on fundamental units of totally real cubic orders and certain quartic orders. This is a joint work with Stephane Louboutin.

LEE Sang June

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Title: On the Number of B_h -Sets

Abstract: A set of positive integers is a B_h -set if all the sums of h elements from the set are distinct. We provide asymptotic bounds for the number of B_h -sets of a given cardinality contained in $[n] = \{1, \dots, n\}$. As a consequence of our results, better upper bounds for a problem of Cameron and Erdos (1990) in the context of B_h -sets are obtained. We use these results to estimate the maximum size of a B_h -set contained in a random subset of $[n]$ with a given cardinality. This is joint work with Domingos Dellamonica Jr., Yoshiharu

Kohayakawa, Vojtech Rodl, and Wojciech Samotij.

LIM Subong

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Title: On quantum modular form

Abstract: A quantum modular form is a new modular object which was introduced by Zagier. In this talk, I will review the basic notions of a quantum modular form and introduce some examples. I will also explain the relation between a quantum modular form and a mock modular form.

LIU Qing

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Title: Very strong approximation on algebraic varieties

Abstract: Let F be a global function field. We show that the Brauer-Manin condition on adelic points for subvarieties of a torus T over F cuts out exactly the rational points. As an application, we prove a conjecture of Harari-Voloch over global function fields which states, roughly speaking, that on any rational hyperbolic curve, the local integral points with the Brauer-Manin condition are the global integral points. Joint work with Fei XU.

LV Guangshi

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Title: Shifted convolution of cusp-forms with θ -series

Abstract: In this talk, we introduce a simple approach to improve a recent result due to Luo, concerning a shifted convolution sum involving the Fourier coefficients of cusp forms with those of theta series.

PARK Jeehoon

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Title: p -adic $(0+0)$ -dimensional quantum field theory and zeta functions

Abstract: We explain how to obtain a p -adic Dwork complex naturally from our formalism of a p -adic $(0+0)$ -dimensional quantum field theory. As its consequence, we find new structures, a BV(Batalin-Vilkovisky) algebra

structure and homotopy Lie algebra (L_∞ -algebra structure), on the p -adic Dwork complex. We also explain how zeta functions of smooth hypersurfaces over finite fields behaves with respect to those new structures. Joint work with Jae-Suk Park and Dohyeong Kim.

SEO Soogil

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Title: On finite layers of \mathbb{Z}_l -extensions and K_2

Abstract: Let F denote a number field. We study a relation between the subgroup of elements whose l th roots generate extensions of F which are contained in a \mathbb{Z}_l -extension of F and a certain kernel of Milnor's K -group defined by Tate. We prove that both groups can be completely described in terms of certain norm-divisible elements over the cyclotomic \mathbb{Z}_l -extension of F .

TONG Jilong

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Title: Néron model of algebraic curves

Abstract: Let R be a Dedekind domain with K its fraction field. Let X_K be a smooth separated algebraic variety over K . By Néron model of X_K , we mean a smooth separated R -model of X_K verifying the so-called Néron mapping property. When X_K is an abelian variety, the notion of Néron model of X_K is very useful in algebraic geometry and in number theory. In this talk, we will discuss the Néron models when X_K is a smooth separated algebraic curve. In particular, we will show that, under some mild assumptions, the Néron model of the algebraic curve X_K do exist. This is a joint work with Q. Liu.

WEI Dasheng

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Title: Strong approximation with the Brauer-Manin obstruction

Abstract: For an algebraic variety, strong approximation may imply the existence of integral points of its integral model. In this talk, I will introduce some varieties which satisfy strong approximation.

XU Zhao

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Title: Nonvanishing of automorphic L -functions at special points

Abstract: Let $\{u_j\}$ be an orthonormal basis of even Hecke-Maass forms for $SL(2, \mathbb{Z})$ with Laplace eigenvalues $\frac{1}{4} + t_j^2$ with $t_j > 0$. We establish a positive proportion non-vanishing result of automorphic L -functions $L(s, u_j)$ at special points $s = \frac{1}{2} + it_j$ in short intervals by using the mollifier technique.

XUE Boqing

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Title: On cubic forms that split off forms

Abstract: It is conjectured that cubic forms in $n \geq 10$ variables have non-trivial integer solutions and the Hasse principle holds as soon as $n \geq 5$. We will discuss some progress on cubic forms that split off forms. The circle method plays an important role, while geometry points of view are also essential.

YANG Enlin

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Title: Logarithmic version of the Milnor formula

Abstract: Let K be a complete discrete valuation field with perfect residue field of positive characteristic $p > 0$. Let V be a representation of the absolute Galois group of K with coefficients in \mathbb{F}_ℓ ($\ell \neq p$). Then the total dimension of V is defined to be the summation of the dimension of V and the Swan conductor of V .

Let X be a projective smooth scheme over an algebraic closed field of characteristic $p > 0$. Let U be an open dense subscheme of X . For a locally constant and constructible sheaf \mathcal{F} of \mathbb{F}_ℓ -vector spaces on the étale topos $U_{\text{ét}}$, a general problem is to define the so-called characteristic cycle $Char(\mathcal{F})$ of \mathcal{F} on the cotangent bundle of X such that

- the Euler number of \mathcal{F} is equal to the intersection product of the characteristic cycle with the zero section of the cotangent bundle.
- for an isolated characteristic point of a morphism f from X to a smooth curve, the total dimension of nearby cycles of f is expected to be the

intersection product of the characteristic cycle with the section defined by a non-vanishing differential form of the curve.

When X is a curve, this is the well-known Grothendieck-Ogg-Shararevich formula. In the tamely ramified case, I show that the total dimension of nearby cycles of f is turn out to be given by a logarithmic version of Milnor formula. In this talk, I will introduce my work in this field and some other recent progress if time permits.

YANG Jae-Hyun

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Title: A note on the Riemann-Schottky problem

Abstract: In this talk I will discuss the Riemann-Schottky problem (briefly the Schottky problem) determining which complex principally polarized abelian varieties arise as Jacobians of smooth algebraic curves. Theta functions play an important role in the study of the Schottky problem.

In the first part of my talk, briefly I will survey the historical background of the Schottky problem. In the second part of my talk, I will discuss the recent progress toward the Schottky problem. Finally I will make a comment on the relationship between the Schottky problem and the André-Oort conjecture.

YANG Jinbang

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Title: On the cohomology of semi-stable p -adic Galois representations

Abstract: Let K be a field of characteristic 0 complete with respect to a non trivial discrete valuation with perfect residue field k of characteristic $p > 0$. Let V be a p -adic representation of the absolute Galois group of K . We compute explicitly Kato's filtration on the continuous cohomology group $H^1(K, V)$. When k is finite, we give a simple proof of Hyodo's celebrated result $H_g(K, V) = H_{st}(K, V)$ for V a potentially semi-stable Galois representation.

ZHAO Lilu

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Title: The quadratic form in prime variables

Abstract: In 2011, Liu initiated the investigation of the quadratic form in prime variables. In particular, Liu solved a wide class of indefinite quadratic equations in 10 or more variables. In this talk, we report the recent progress on the quadratic form in 9 prime variables.