Advanced Studies in Pure Mathematics 30, 2001 Class Field Theory – Its Centenary and Prospect pp. 509–536

Adele Geometry of Numbers

Masanori Morishita and Takao Watanabe

Dedicated to Professors Ichiro Satake and Takashi Ono

This is a historical and expository account on adele geometry. The word *adele geometry* appeared in the lectures ([W4], 1959–1960) by A. Weil which were stimulated by works of Siegel–Tamagawa on quadratic forms. Our main concern here is to exhibit the strings of thoughts in the development of this topic originated from Minkowski's *geometry of numbers*. The subject was originally related to integral geometry and some diophantine problems, and we discuss such aspects in adele geometry on homogeneous spaces.

Contents

- 1. From geometry of numbers to adele geometry
 - 1.1. Minkowski's geometry of numbers
 - 1.2. Siegel's main theorem and mean value theorem
 - 1.3. Ono's G-idele and Tamagawa's interpretation of Siegel's formula
 - 1.4. Weil's integration theory and adele geometry
- 2. Tamagawa numbers and the mean value theorem in adele geometry
 - 2.1. Tamagawa numbers
 - 2.2. Mean value theorem in adele geometry
- 3. Geometry of numbers over adele spaces
 - 3.1. Adelic fundamental theorems of Minkowski
 - 3.2. Adelic Minkowski–Hlawka theorem
 - 3.3. Generalized Hermite constants
- 4. Distribution of rational points in adele transformation spaces
 - 4.1. Hardy–Littlewood variety and Weyl–Kuga's criterion on uniform distribution

Received August 28, 1998 Revised October 5, 1998