

## Graduate Texts in Mathematics

Henning Stichtenoth

# Algebraic Function Fields and Codes

$$Y^l - Y = \frac{X^l}{1 - X^{l-1}}$$

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# Algebraic Function Fields and Codes

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15 years after the first printing of Algebraic Function Fields and Codes, the mathematics editors of Springer Verlag encouraged me to revise and extend the book. Besides numerous minor corrections and amendments, the second edition differs from the first one in two respects. Firstly I have included a series of exercises at the end of each chapter. Some of these exercises are fairly easy and should help the reader to understand the basic concepts, others are more advanced and cover additional material. Secondly a new chapter titled "Asymptotic Bounds for the Number of Rational Places" has been added. This chapter contains a detailed presentation of the asymptotic theory of function fields over finite fields, including the explicit construction of some asymptotically good and optimal towers. Based on these towers, a complete and self-contained proof of the Tsfasman-Vladut-Zink Theorem is given. This theorem is perhaps the most beautiful application of function fields to coding theory. The codes which are constructed from algebraic function fields were first introduced by V. D. Goppa. Accordingly I referred to them in the first edition as geometric Goppa codes. Since this terminology has not generally been accepted in the literature, I now use the more common term algebraic geometry codes or AG codes. I would like to thank Alp Bassa, Arnaldo Garcia, Cem Guneri, Sevan Harput and Alev Topuzoglu for their help in preparing the second edition.

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