

3264 AND ALL THAT

A Second Course in Algebraic Geometry

The enumeration of solutions to systems of polynomial equations in several variables has been an active area of mathematics since the early work of Leibniz. In the 19th century, Chasles calculated that there are 3264 smooth conic plane curves tangent to five given general conics – a landmark in the field and perhaps the first important “excess intersection” problem.

Such computations in intersection theory were part of the motivation of Poincaré’s development of topology, and also figured in Hilbert’s Problems from 1900. Since then, intersection theory has become a topic of central importance in mathematics, with applications to topology, number theory and mathematical physics.

This book can form the basis of a second course in algebraic geometry. As motivation, it takes concrete problems from enumerative geometry and intersection theory. Its aim is to provide intuition and technique so that the student develops the ability to solve geometric problems.

The authors explain and illustrate key ideas such as rational equivalence, Chow rings, Grassmanians, Schubert calculus and Chern classes, excess intersection theory and the Grothendieck Riemann–Roch theorem. The geometric applications range from the 27 lines on a cubic surface through the existence of special divisors on Riemann surfaces.

Readers will appreciate the abundance of examples, many provided as exercises with solutions available online.

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