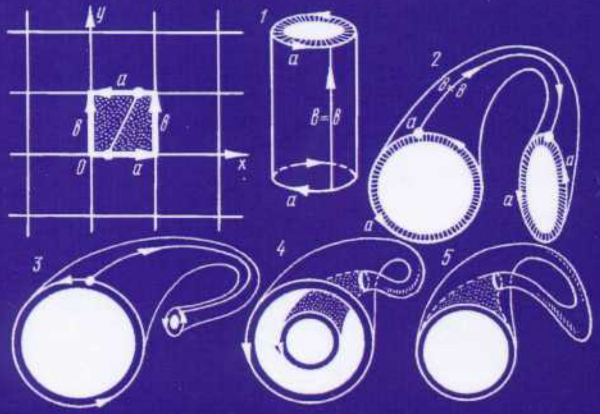

A Short Course in Differential Geometry and Topology

A.T. Fomenko and A.S. Mishchenko

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Preface

A Short Course on Differential Geometry and Topology by Professor A.T. Fomenko and Professor A.S. Mishchenko is based on the course taught at the Faculty of Mechanics and Mathematics of Moscow State University. It is intended for students of mathematics, mechanics and physics and also provides a useful reference text for postgraduates and researchers specialising in modern geometry and its applications.

The course is structured in seven chapters and covers the basic material on general topology, nonlinear coordinate systems, theory of smooth manifolds, theory of curves and surfaces, transformation groups, tensor analysis and Riemannian geometry, theory of integration and homologies, fundamental groups and variational problems of Riemannian geometry. All of the chapters are highly illustrated and the text is supplemented by a large number of definitions, examples, problems, exercises to test the concepts introduced. The material has been carefully selected and is presented in a concise manner which is easily accessible to students.

Chapter 1: Introduction to Differential Geometry

This chapter consists of four sections and includes definitions, examples, problems and illustrations to aid the reader.

1.1 Curvilinear Coordinate Systems. Simplest Examples
1.2 The Length of a Curve in Curvilinear Coordinates
1.3 Geometry on the Sphere and Plane
1.4 Pseudo-Sphere and Lobachevskii Geometry

Chapter 2: General Topology

This chapter is an introduction to topology and the development of topology. Topology is a field of mathematics which studies the properties of geometric that are not changed under a "deformation" or other transformations similar to deformations. General topology arose as a result of studying the most general properties of geometric spaces and their transformations related to the convergence and continuity properties.

The chapter consists of four sections and includes examples, definitions, problems and illustrations.

Chapter 3: Smooth Manifolds: General Theory

This chapter covers the general theory of smooth manifolds, introduces the manifold as a special concept in geometry and includes definitions, examples and problems to test understanding.

Chapter 4: Smooth Manifolds: Examples

This chapter continues the study of smooth manifolds and focuses on examples.

Chapter 5: Tensor Analysis and Riemannian Geometry

This chapter studies local properties of smooth manifolds and includes definitions, illustrations, exercises and examples throughout.

Chapter 6: Homology Theory

This chapter focuses on the properties of manifolds on which other functions and mapping depend. Examples and illustrations are included throughout the chapter.

Chapter 7: Simplest Variational Problems of Riemannian Geometry
This chapter begins with the general concept of functional and its variation and subsequent sections cover extremality of geodesies, minimal surfaces, calculus of variations and symplectic geometry.

A Short Course in Differential Geometry and Topology is intended for students of mathematics, mechanics and physics and also provides a useful reference text for postgraduates and researchers specialising in modern geometry and its applications.

Selected Problems in Differential Geometry and Topology
A.T. Fomenko, A.S. Mischenko and Y.P. Solovyev
ISBN: 978-1-904868-33-0 Cambridge Scientific Publishers 2008 is designed as an associated companion volume to *A Short Course in Differential Geometry and Topology* and is based on seminars conducted at the Faculty of Mechanics and Mathematics of Moscow State University for second and third year mathematics and mechanics students. The two volumes complement each other and can be used as a two volume set.

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A.T. Fomenko and A.S. Mishchenko
Moscow State University

This volume is intended for graduates and research students in mathematics and physics. It covers general topology, nonlinear co-ordinate systems, theory of smooth manifolds, theory of curves and surfaces, transformation groups, tensor analysis and Riemannian geometry, theory of integration and homologies, fundamental groups and variational principles in Riemannian geometry. The text is presented in a form that is easily accessible to students and is supplemented by a large number of examples, problems, drawings and appendices.

ABOUT THE AUTHORS

Anatoly T. Fomenko is a full member of the Russian Academy of Sciences and Professor, Head of Department of Differential Geometry and Applications, Faculty of Mathematics and Mechanics at Moscow State University. He is a well-known specialist and the author of fundamental results in the fields of geometry, topology, multidimensional calculus of variations, Hamiltonian mechanics and computer geometry.

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