
Contents

IAS/Park City Mathematics Institute	vii
Preface	ix
Chapter 1. Introduction to Riemannian geometry	1
§1.1. Riemann's Habilitation lecture in examples	1
§1.2. The framework of Riemannian geometry	16
§1.3. Geodesics	29
Chapter 2. Differential calculus with tensors	45
§2.1. Introduction to differential calculus	45
§2.2. Tensors	60
§2.3. Differentiation of tensors	76
Chapter 3. Curvature	89
§3.1. Intuiting curvature via Jacobi equation	89
§3.2. Ricci and scalar curvature	104
Chapter 4. General relativity	123
§4.1. The framework of special relativity	123
§4.2. Gravity and general relativity	144
§4.3. Geometry of Schwarzschild space-time	162

§4.4. Kruskal-Szekeres extension of Schwarzschild space-time	178
Chapter 5. Introduction to geometric analysis	199
§5.1. The (relativistic) Poisson problem	199
§5.2. On the concept of mass	218
Bibliography	239
Index	241