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Induced Connection; Geodesics in Submanifolds; Totally Geodesic Submanifolds; Semi-Riemannian Hypersurfaces; Hyperquadrics; The Codazzi Equation; Totally Umbilic Hypersurfaces; The Normal Connection
A Congruence TheoremIsometric Immersions; Two-Parameter Maps; CHAPTER 5. RIEMANNIAN AND LORENTZ GEOMETRY; The Gauss Lemma; Convex Open Sets; Arc Length; Riemannian Distance; Riemannian Completeness; Lorentz Causal Character; Timecones; Local Lorentz Geometry; Geodesics in Hyperquadrics; Geodesics in Surfaces; Completeness and Extendibility; CHAPTER 6. SPECIAL RELATIVITY; Newtonian Space and Time; Newtonian Space-Time; Minkowski Spacetime; Minkowski Geometry; Particles Observed; Some Relativistic Effects; Lorentz-Fitzgerald Contraction; Energy-Momentum; Collisions; An Accelerating Observer
CHAPTER 7. CONSTRUCTIONSDeck Transformations; Orbit Manifolds; Orientability; Semi-Riemannian Coverings; Lorentz Time-Orientability; Volume Elements; Vector Bundles; Local Isometries; Matched Coverings; Warped Products; Warped Product Geodesics; Curvature of Warped Products; Semi-Riemannian Submersions; CHAPTER 8. SYMMETRY AND CONSTANT CURVATURE; Jacobi Fields; Tidal Forces; Locally Symmetric Manifolds; Isometries of Normal Neighborhoods; Symmetric Spaces; Simply Connected Space Forms; Transvections; CHAPTER 9. ISOMETRIES; Semiorthogonal Groups; Some Isometry Groups Time-Orientability and Space-OrientabilityLinear Algebra; Space Forms; Killing Vector Fields; The Lie Algebra i(M); I(M) as Lie Group; Homogeneous Spaces; CHAPTER 10. CALCULUS OF VARIATIONS; First Variation; Second Variation; The Index Form; Conjugate Points; Local Minima and Maxima; Some Global Consequences; The Endmanifold Case; Focal Points; Applications; Variation of E; Focal Points along Null Geodesics; A Causality Theorem; CHAPTER 11. HOMOGENEOUS AND SYMMETRIC SPACES; More about Lie Groups; Bi-Invariant Metrics; Coset Manifolds; Reductive Homogeneous Spaces; Symmetric Spaces Riemannian Symmetric Spaces

Sommario/riassunto

This book is an exposition of semi-Riemannian geometry (also called pseudo-Riemannian geometry)--the study of a smooth manifold furnished with a metric tensor of arbitrary signature. The principal special cases are Riemannian geometry, where the metric is positive definite, and Lorentz geometry. For many years these two geometries have developed almost independently: Riemannian geometry reformulated in coordinate-free fashion and directed toward global problems, Lorentz geometry in classical tensor notation devoted to general relativity. More recently, this divergence has been re