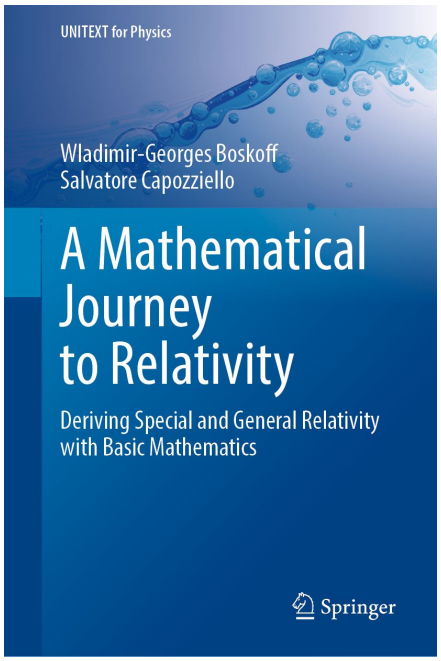

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Wladimir-Georges Boskoff, Salvatore Capozziello

A Mathematical Journey to Relativity

Deriving Special and General Relativity with Basic Mathematics

Reihe: UNITEXT for Physics

- Explains how special and general relativity are derived from basic mathematics
- Describes differential geometry in the simplest possible way and applies it in describing the physical world
- Presents Einstein's field equations and their physical implications
- Provides detailed proofs

This book opens with an axiomatic description of Euclidean and non-Euclidean geometries. Euclidean geometry is the starting point to understand all othergeometries and it is the cornerstone for our basic intuition of vector spaces. The generalization to non-Euclidean geometry is the following step to developthe language of Special and General Relativity. These theories are discussed starting from a full geometric point of view. Differential geometry is presented in the simplest way and it is applied to describe the physical world. The final result of this construction is deriving the Einstein field equations for gravitation and spacetime dynamics. Possible solutions, and their physical implications are also discussed: the Schwarzschild metric, the relativistic trajectory of planets, the deflection of light, the black holes, the cosmological solutions like de Sitter, Friedmann-Lemaître-Robertson-Walker, and Gödel ones. Some current problems like dark energy are also scketched. The book is self-contained and includes details of all proofs. It provides solutions or tips to solve problems and exercises. It is designed for undergraduate students and for all readers who want a first geometric approach to Special and General Relativity.