GENERAL RELATIVITY AND COSMOLOGY

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Contents

CHAPTER 1.

This survey is for mathematicians but is about physics. We have in mind a reader who hasn't worked on physics since sophomore days but is familiar with tensor algebra, differential topology and Riemannian geometry on the introductory graduate level. The theory of Lie groups is needed for discussing examples but not for the fundamental ideas.

This chapter gives some physics background. Chapters 2–6 discuss basic general and special relativity, including a very brief introduction to the theory of black holes. Chapter 7 gives a sample application, cosmology. We should point out that §7.2 summarizes the basic facts of cosmology and is entirely descriptive; it can be understood by a reader who ignores all but the basic definitions of this survey. Chapter 8 gives some examples of mathematics used in current research.

We concentrate on basic current physics at the textbook or folk theorem level. Bibliographical references will be sparse. [14], [20] and [9] are physics texts which give historical background and far more details. [18] is in the same style as this article.

1.1. Conventions. We give a few examples of our notation and terminology. *Smooth* means C^∞. For us, a *manifold* is paracompact, Hausdorff, real, finite dimensional and smooth. M denotes a manifold throughout. TM is the tangent bundle with projection π; thus if M_x denotes the tangent space of M