SF3674 DIFFERENTIAL GEOMETRY, GRADUATE COURSE, FALL 2016, READING INSTRUCTIONS AND EXERCISES

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Lecture 2, Tuesday September 13

Reading instructions. In this lecture we introduced the curvature tensor of a (semi-)Riemannian manifold, and the sectional, Ricci, and scalar curvatures. For this material you can look at

- Chapter 3, pages 74–96, in O'Neill's book [4];
- Chapter 4 in the lecture notes [5], in particular you should study the examples where curvature is computed explicitely;
- Sections 3.1–3.3 of Bär's lecture notes [1].

For background and overview you can have a look at

- Berger's book [2], in particular Chapter 4, and Section 4.4;
- Gromov's paper [3], in particular §1 and the following sections (but this is definitely harder to read).

Exercises.

(1) O'Neill [4] problems 3.4, 3.5, 3.6, 3.8, 3.20, 3.21 (pp.94–96).

References

[1] Christian Bär. Differential geometry, summer term 2013. http://www.math.uni-potsdam.de/fileadmin/user_upload/Prof-Geometrie/Dokumente/Lehre/Lehrmaterialien/skript-DiffGeo-engl.pdf.

[2] Marcel Berger. *A panoramic view of Riemannian geometry*. Springer-Verlag, Berlin, 2003. URL: http://dx.doi.org/10.1007/978-3-642-18245-7, doi:10.1007/978-3-642-18245-7.

[3] M. Gromov. Sign and geometric meaning of curvature. *Rend. Sem. Mat. Fis. Milano*, 61:9–123 (1994), 1991. URL: http://dx.doi.org/10.1007/BF02925201, doi:10.1007/BF02925201.

[4] Barrett O'Neill. *Semi-Riemannian geometry*, volume 103 of *Pure and Applied Mathematics*. Academic Press, Inc. [Harcourt Brace Jovanovich, Publishers], New York, 1983. With applications to relativity.

[5] Hans Ringström. A brief introduction to semi-riemannian geometry and general relativity. https://people.kth.se/~hansr/Semi_Riemannian_Geometry.pdf.