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

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LECTURE 6, TUESDAY OCTOBER 11

Reading instructions. The sixth lecture was an overview of homogeneous spaces, symmetric spaces, and the holonomy of a Riemannian manifold. The contents roughly corresponds to:

- Lie groups, basics, [3, Appendix B, pp. 446-452].
- Killing fields, the isometry group of a Riemannian manifold as a Lie group, homogeneous spaces, [3, Chapter 9, pp. 249-262].
- Symmetric spaces [4, Chapter 10.1-10.2] (but not the details of the Lie algebra description in Section 10.1.3).
- Holonomy [4, Chapter 10.3]

Symmetric spaces are also treated in [3, Chapter 11]. Further reading on holonomy can be found in [1] and [2].

Exercises.

(1) O'Neill [3] problems 9.14, 9.15 (p. 260).
(2) Petersen [4] exercises 10.5.1, 10.5.2, 10.5.9, 10.5.11, 10.5.13 (pp. 392-393).

REFERENCES

[1] Robert Bryant. Recent advances in the theory of holonomy. *Astérisque*, (266):Exp. No. 861, 5, 351–374, 2000. Séminaire Bourbaki, Vol. 1998/99.
[2] Dominic D. Joyce. *Riemannian holonomy groups and calibrated geometry*, volume 12 of *Oxford Graduate Texts in Mathematics*. Oxford University Press, Oxford, 2007.
[3] 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.
[4] Peter Petersen. *Riemannian geometry*, volume 171 of *Graduate Texts in Mathematics*. Springer, Cham, third edition, 2016. URL: http://dx.doi.org/10.1007/978-3-319-26654-1, doi:10.1007/978-3-319-26654-1.