

### Topics for a presentation, Differential Geometry II, MATH623

Please choose two of the topics below, primary and secondary, and inform me about your choices by Friday November 18 by printing this page, putting your name on it, and marking your first and second choices (if you want to present another topic related to the class, please consult with me). Then I will decide which topic among those two topics you will present. I will provide you with additional materials if the topic is not from the Do Carmo book. Then prepare one hour presentation (will be given in front of me in my office or in a classroom at six floor). You are welcome to come with any question during your preparations. The presentation will take place from December 8 till December 14. I will create the doodle pole for defining the schedule.

1. Convex neighbourhoods (Do Carmo, Chapter 3, section 4).
2. Hopf-Rinow and Hadamard theorems (Do Carmo, Chapter 7, sections 2 and 3).
3. Weinstein-Synge Theorem (Do Carmo, Chapter 9, section 3, Theorem 3.7).
4. Applications of the Index Lemma to immersions (Chapter 10, Section 3).
5. Volume and curvature: Bishop comparison theorems (possible source: Gallot, Hulin, Lafontaine "Riemannian Geometry", chapter 3 H, the material will be provided).
6. Curvature tensor and representation of orthogonal group (possible source: possible source: Gallot, Hulin, Lafontaine "Riemannian Geometry" chapter 3 K, the material will be provided).
7. Manifolds with negative curvature: Preismann's theorem (Do Carmo, Chapter 12 section 3).
8. The cut locus (Do Carmo, Chapter 13, Section 2).
9. The sphere theorem (Do Carmo, chapter 13, Section 4).
10. Topics on complex manifolds (some topic from chapter IX of Kobayashi, Nomizu "Foundation of Differential Geometry", Vol II, the material will be provided).
11. Curvature of optimal control problems (form Agrachev, Sachkov "Control Theory from the Geometric Viewpoint" Chapter 23, Section 1, the material will be provided).