

Introduction to Manifolds Syllabus

This material will be covered on both the Algebraic Topology and the Geometry Prelims.

1. Multidimensional Calculus, including the Mean Value Theorem, the Implicit Function Theorem and the Inverse Function Theorem.
2. Definition of Differentiable Manifold. Including the concepts of chart, atlas, C^r functions, local co-ordinates, and sub-manifolds.
3. Definition of tangent space and cotangent space to a manifold. Including the concept of tangent bundle and the definition of the derivative of a smooth function between manifolds. Definition and properties of immersions, submersions and embeddings.
4. Vector fields and Flows
5. Sard's Theorem and elementary applications, including the Whitney embedding theorem.
6. The tubular neighborhood theorem and smooth approximation of continuous functions.
7. Transversality Theory. Including the definition of transversality, transversal intersection of submanifolds and the transversality theorem.

REFERENCES

Bredon, G. "Topology and Geometry", Chapter II sections 1-11, 15.
Milnor, J. "Topology from the Differentiable Viewpoint", Chapters 1-3.
Guillemin and Pollack, "Differential Topology", Chapters 1-2, Appendix 1.