

TOPICS FOR MATHEMATICS 246B, FALL 2007

Preface

Background and review

I. Differential forms and their integrals

1. Differential 1-forms and the fundamental group (Conlon, §§ 6.2–6.4)
2. Extending Green's and Stokes' Theorems
3. Generalized Stokes' Formula (Conlon, § 8.2)

II. De Rham cohomology

1. Smooth singular cochains (Hatcher, § 2.1)
2. Homological Comparison Theorem (Hatcher, § 2.3)
3. Eilenberg - Steenrod properties (Hatcher, §§ 2.1, 2.3, 3.1; Conlon, § 2.6, 8.1, 8.3–8.5)
4. De Rham's Theorem (Conlon, §§ 8.9, D.1–D.3)

III. Cohomology and coefficients

1. Definitions and basic properties (Hatcher, §§ 2.2, 3.1)
2. Universal Coefficient Theorems (Hatcher, §§ 3.1, 3.A)
3. The Künneth Formula (Hatcher, §§ 2.2, 3.2, 3.B)
4. Products (Hatcher, §§ 3.2, 3.3)
5. Projective spaces (Hatcher, §§ 3.2, 3.3)
6. Dimension theory (Munkres, § 50)

IV. Homotopy and cohomology

1. Categories of CW complexes (Hatcher, Ch. 0, §§ 1.A, 1.B, 2.2, 4.1, 4.A, Appendix)
2. Group structures (Hatcher, §§ 4.1, 4.2, 4.A)
3. Homotopy exact sequences (Hatcher, §§ 4.1, 4.2)
4. Representability Theorems (Hatcher, §§ 4.E, 4.F)
5. Homotopy, homology and cohomology (Hatcher, §§ 4.1, 4.3, 4.E, 4.H, 4.L)

V. Poincaré duality

1. Orientations (Hatcher, § 3.3; Conlon, § 3.4, 8.2, 10.1)
2. Duality mappings (Hatcher, § 3.3)
3. Poincaré and Lefschetz duality (Hatcher, § 3.3; Conlon, § 8.8)
4. Alexander duality (Hatcher, § 3.3)

VI. Fixed point theorems

1. Simplicial approximation (Hatcher, 2.C)
2. The Lefschetz Fixed Point Theorem (Hatcher, 2.C)
3. Special cases