

Contents

Preface ix
A remark on notation x
Acknowledgments xi

Chapter 1. Real analysis

§1.1. A quick review of measure and integration theory 3
§1.2. Signed measures and the Radon-Nikodym-Lebesgue theorem 15
§1.3. $L^p$ spaces 27
§1.4. Hilbert spaces 45
§1.5. Duality and the Hahn-Banach theorem 59
§1.6. A quick review of point-set topology 71
§1.7. The Baire category theorem and its Banach space consequences 85
§1.8. Compactness in topological spaces 101
§1.9. The strong and weak topologies 117
§1.10. Continuous functions on locally compact Hausdorff spaces 133
§1.11. Interpolation of $L^p$ spaces 157
§1.12. The Fourier transform 183
§1.13. Distributions 211
§1.14. Sobolev spaces 235
§1.15. Hausdorff dimension 257

Chapter 2. Related articles
§2.1. An alternate approach to the Carathéodory extension theorem 277
§2.2. Amenability, the ping-pong lemma, and the Banach-Tarski paradox 281
§2.3. The Stone and Loomis-Sikorski representation theorems 293
§2.4. Well-ordered sets, ordinals, and Zorn’s lemma 301
§2.5. Compactification and metrisation 311
§2.6. Hardy’s uncertainty principle 317
§2.7. Create an epsilon of room 323
§2.8. Amenability 333

Bibliography 339

Index 345