

# Table of Contents

Preface . . . . .	V
Chapter One: Set Theory and Algebra . . . . .	1
Section 1. The algebra of sets . . . . .	1
Section 2. Relations and functions . . . . .	7
Section 3. The axiom of choice and some equivalents . . . . .	12
Section 4. Cardinal numbers and ordinal numbers . . . . .	19
Section 5. Construction of the real and complex number fields . . . . .	32
Chapter Two: Topology and Continuous Functions . . . . .	53
Section 6. Topological preliminaries . . . . .	53
Section 7. Spaces of continuous functions . . . . .	81
Chapter Three: The Lebesgue Integral . . . . .	104
Section 8. The Riemann-Stieltjes integral . . . . .	105
Section 9. Extending certain functionals . . . . .	114
Section 10. Measures and measurable sets . . . . .	125
Section 11. Measurable functions . . . . .	148
Section 12. The abstract Lebesgue integral . . . . .	164
Chapter Four: Function Spaces and Banach Spaces . . . . .	188
Section 13. The spaces $\mathcal{L}_p$ ( $1 \leq p < \infty$ ) . . . . .	188
Section 14. Abstract Banach spaces . . . . .	209
Section 15. The conjugate space of $\mathcal{L}_p$ ( $1 < p < \infty$ ) . . . . .	222
Section 16. Abstract Hilbert spaces . . . . .	234
Chapter Five: Differentiation . . . . .	256
Section 17. Differentiable and nondifferentiable functions . . . . .	256
Section 18. Absolutely continuous functions . . . . .	272
Section 19. Complex measures and the LEBESGUE-RADON-NIKODÝM theorem . . . . .	304
Section 20. Applications of the LEBESGUE-RADON-NIKODÝM theorem . . . . .	341
Chapter Six: Integration on Product Spaces . . . . .	377
Section 21. The product of two measure spaces . . . . .	377
Section 22. Products of infinitely many measure spaces . . . . .	429
Index of Symbols . . . . .	460
Index of Authors and Terms . . . . .	462