

Contents

PREFACE	v
1 RINGS	1
1.1 Basic definitions and examples	2
1.2 Ring homomorphisms	20
1.3 Localization of integral domains	34
1.4 Unique factorization	43
1.5 *Additional noncommutative examples	50
2 MODULES	63
2.1 Basic definitions and examples	64
2.2 Direct sums and products	78
2.3 Semisimple modules	88
2.4 Chain conditions	97
2.5 Modules with finite length	102
2.6 Tensor products	109
2.7 Modules over principal ideal domains	121
2.8 *Modules over the Weyl algebras	127
3 STRUCTURE OF NONCOMMUTATIVE RINGS	137
3.1 Prime and primitive ideals	138
3.2 The Jacobson radical	147
3.3 Semisimple Artinian rings	155
3.4 *Orders in simple Artinian rings	161
4 REPRESENTATIONS OF FINITE GROUPS	171
4.1 Introduction to group representations	172
4.2 Introduction to group characters	187
4.3 Character tables and orthogonality relations	196
A APPENDIX	207
A.1 Review of vector spaces	207
A.2 Zorn's Lemma	211
A.3 Matrices over commutative rings	213
A.4 Eigenvalues and characteristic polynomials	216
A.5 Noncommutative quotient rings	221
A.6 The ring of algebraic integers	226

BIBLIOGRAPHY	229
INDEX OF SYMBOLS	231
INDEX	233