CONTENTS

Preface vii

Chapter 1. Sturm-Liouville operators on a finite interval 1
1.1. Behavior of the spectrum 1
1.2. Properties of eigenfunctions 10
1.3. Transformation operators 15
1.4. Uniqueness theorems 20
1.5. The Gelfand-Levitan method 27
1.6. The method of spectral mappings 46
1.7. The method of standard models 71
1.8. Local solution of the inverse problem 74
1.9. Review of the inverse problem theory 94

Chapter 2. Sturm-Liouville operators on the half-line 99
2.2. Recovery of the differential equation from the Weyl function 118
2.3. Recovery of the differential equation from the spectral data 128
2.4. An inverse problem for a wave equation 144
2.5. The generalized Weyl function 155
2.6. The Weyl sequence 160

Chapter 3. Inverse scattering on the line 165
3.1. Scattering data 165
3.2. The main equation 180
3.3. The inverse scattering problem 185
3.4. Reflectionless potentials. Modification of the discrete spectrum 199

Chapter 4. Applications of the inverse problem theory 201
4.1. Solution of the Korteweg-de Vries equation on the line 201
4.2. Korteweg-de Vries equation on the half-line. Nonlinear reflection 205
4.3. Constructing parameters of a medium from incomplete spectral information 213
4.4. Discontinuous inverse problems 233
4.5. Inverse problems in elasticity theory 249
4.6. Boundary value problems with aftereffect 254
4.7. Differential operators of the Orr-Sommerfeld type 265
4.8. Differential equations with turning points 270

References 285

Index 303