Contents

	Preface	*page* ix
	Acknowledgments	xi
1	**Vectors and Functions**	1
1.1	Vector Basics	2
1.2	Dirac Notation	8
1.3	Abstract Vectors and Functions	14
1.4	Complex Numbers, Vectors, and Functions	18
1.5	Orthogonal Functions	22
1.6	Finding Components Using the Inner Product	26
1.7	Problems	30
2	**Operators and Eigenfunctions**	32
2.1	Operators, Eigenvectors, and Eigenfunctions	32
2.2	Operators in Dirac Notation	37
2.3	Hermitian Operators	43
2.4	Projection Operators	49
2.5	Expectation Values	56
2.6	Problems	60
3	**The Schrödinger Equation**	63
3.1	Origin of the Schrödinger Equation	64
3.2	What the Schrödinger Equation Means	71
3.3	Time-Independent Schrödinger Equation	78
3.4	Three-Dimensional Schrödinger Equation	81
3.5	Problems	93

4 Solving the Schrödinger Equation 95
4.1 The Born Rule and Copenhagen Interpretation 96
4.2 Quantum States, Wavefunctions, and Operators 98
4.3 Characteristics of Quantum Wavefunctions 102
4.4 Fourier Theory and Quantum Wave Packets 111
4.5 Position and Momentum Wavefunctions and Operators 132
4.6 Problems 144

5 Solutions for Specific Potentials 146
5.1 Infinite Rectangular Potential Well 147
5.2 Finite Rectangular Potential Well 168
5.3 Harmonic Oscillator 193
5.4 Problems 216

References 218
Index 219