Contents

Preface vii

Acknowledgments ix

CHAPTER 1 VECTORS AND ANALYTIC GEOMETRY

1.1 The Vector Space R^n 1
1.2 Lines and Planes 27
1.3 Vectors in R^3 45
1.4 Motion in R^3 70
1.5 Parametrically Defined Curves 85
1.6 Coordinate Systems in R^3 99
1.7 Surfaces in R^3 110

CHAPTER 2 DIFFERENTIAL CALCULUS OF REAL-VALUED FUNCTIONS

2.1 Functions, Limits, and Continuity 120
2.2 Directional and Partial Derivatives 139
2.3 Differentiable Functions 151
2.4 The Mean-Value Theorem 164
2.5 Graphs and Tangent Planes 170
2.6 Implicit Functions 178
2.7 The Gradient 187
2.8 Taylor's Theorem 198
2.9 Maxima and Minima 212
2.10 The Method of Lagrange Multipliers 224

CHAPTER 3 DIFFERENTIAL CALCULUS OF VECTOR-VALUED FUNCTIONS

3.1 Functions, Limits, and Continuity 238
3.2 Differentiable Functions 254
3.3 The Chain Rule 264
3.4 Vector and Scalar Fields 278
3.5 Implicit Functions 293
3.6 Inverse Functions and Coordinate Transformations 304

CHAPTER 4 INTEGRATION

4.1	Multiple Integrals	316
4.2	Iterated Integrals	332
4.3	Change of Variables	347
4.4	Physical Applications	368
4.5	Line Integrals	391
4.6	Surface Integrals of Scalar Fields	426
4.7	Surface Integrals of Vector Fields	444
4.8	The Divergence Theorem; Green's and Stokes's Theorems	460

Answers to Selected Problems 475

Index 501