# Contents


Chapter 1
Graphs and Level Sets 1

Chapter 2
Vector Fields 6

Chapter 3
The Tangent Space 13

Chapter 4
Surfaces 16

Chapter 5
Vector Fields on Surfaces; Orientation 23

Chapter 6
The Gauss Map 31

Chapter 7
Geodesics 38

Chapter 8
Parallel Transport 45

Chapter 9
The Weingarten Map 53

Chapter 10
Curvature of Plane Curves 62

Chapter 11
Arc Length and Line Integrals 68

Chapter 12
Curvature of Surfaces 82

Chapter 13
Convex Surfaces 95

Chapter 14
Parametrized Surfaces 108

Chapter 15
Local Equivalence of Surfaces and Parametrized Surfaces 121

Chapter 16
Focal Points 132

Chapter 17
Surface Area and Volume 139

Chapter 18
Minimal Surfaces 156

Chapter 19
The Exponential Map 163

Chapter 20
Surfaces with Boundary 177

Chapter 21
The Gauss-Bonnet Theorem 190

Chapter 22
Rigid Motions and Congruence 210

Chapter 23
Isometries 220

Chapter 24
Riemannian Metrics 231

Bibliography 245

Notational Index 247

Subject Index 249