

CONTENTS

Preface	v
Chapter 1. Elementary Differential Geometry	1
1-1 Curves	1
1-2 Vector and Matrix Functions	8
1-3 Some Formulas	11
Chapter 2. Curvature	15
2-1 Arc Length	15
2-2 The Moving Frame	18
2-3 The Circle of Curvature	28
Chapter 3. Evolutes and Involutives	35
3-1 The Riemann-Stieltjès Integral	35
3-2 Involutives and Evolutes	39
3-3 Spiral Arcs	48
3-4 Congruence and Homothety	58
3-5 The Moving Plane	62
Chapter 4. Calculus of Variations	73
4-1 Euler Equations	73
4-2 The Isoperimetric Problem	79
Chapter 5. Introduction to Transformation Groups	86
5-1 Translations and Rotations	86
5-2 Affine Transformations	94
Chapter 6. Lie Group Germs	103
6-1 Lie Group Germs and Lie Algebras	103
6-2 The Adjoint Representation	110
6-3 One-parameter Subgroups	116
Chapter 7. Transformation Groups	125
7-1 Transformation Groups	125

7-2	Invariants	135
7-3	Affine Differential Geometry	147
Chapter 8.	Space Curves	156
8-1	Space Curves in Euclidean Geometry	156
8-2	Ruled Surfaces	162
8-3	Space Curves in Affine Geometry	170
Chapter 9.	Tensors	175
9-1	Dual Spaces	175
9-2	The Tensor Product	181
9-3	Exterior Calculus	186
9-4	Manifolds and Tensor Fields	196
Chapter 10.	Surfaces	206
10-1	Curvatures	206
10-2	Examples	217
10-3	Integration Theory	229
10-4	Mappings and Deformations	238
10-5	Closed Surfaces	249
10-6	Line Congruences	256
Chapter 11.	Inner Geometry of Surfaces	261
11-1	Geodesics	261
11-2	Clifford-Klein Surfaces	272
11-3	The Bonnet Formula	282
Chapter 12.	Affine Geometry of Surfaces	290
12-1	Frenet Formulas	290
12-2	Special Surfaces	300
12-3	Curves on a Surface	309
Chapter 13.	Riemannian Geometry	314
13-1	Parallelism and Curvature	314
13-2	Geodesics	329
13-3	Subspaces	337
13-4	Groups of Motions	342
13-5	Integral Theorems	350
Chapter 14.	Connections	356
	Answers to Selected Exercises	365
	Index	369