

PART TWO

Differential Geometry in the Large

Stanford University 1956
Notes by J.W. Gray

CONTENTS

Introduction

I. Differential Geometry of Surfaces in the Small

0. Notation

1. Elementary Concepts

2. First Fundamental Form

3. Geodesic Lines

4. Parallel Displacement

5. Riemannian Space

6. Curvature in Two-Dimensional Riemannian Geometry

7. The Gauss Curvature of Surfaces in E^3

8. The Second Fundamental Form

9. The Relation Between the Two Fundamental Forms

10. Miscellaneous Remarks

II. Some General Remarks on Closed Surfaces in Differential Geometry

1. Simple Closed Surfaces in E^3

2. Abstract Closed Surfaces

3. General Closed Surfaces in E^3

4. Riemannian Geometry

III. The Total Curvature (Curvatura Integra) of a Closed Surface with Riemannian Metric and Poincaré's Theorem on the Singularities of Fields of Line Elements

1. Singularities of Families of Curves

2. The Main Theorems

3. The Degree of the Spherical Map

4. Generalizations to Higher Dimensions

IV. Hadamard's Characterization of the Ovaloids

1. Ovaloids in E^3

2. Generalizations to Higher Dimensions

V. Closed Surfaces with Constant Gauss Curvature (Hilbert's Method) - Generalizations and Problems - General Remarks on Weingarten Surfaces

1. A Characterization of the Sphere

2. Weingarten Surfaces

3. The Isoperimetric Problem and Surfaces with Constant H

VI. General Closed Surfaces of Genus 0 with Constant Mean Curvature - Generalizations

1. Isothermic Parameters

2. The Main Theorem

3. Special Weingarten Surfaces

VII. Simple Closed Surfaces (of Arbitrary Genus) with Constant Mean Curvature - Generalizations

1. Introduction

2. Another Characterization of the Sphere

3. A "Symmetry" Property of Simple Closed Surfaces

4. Absolutely Elliptic Partial Differential Equations

5. The Main Theorem

6. Generalizations - Simple Closed Weingarten Surfaces

VIII. The Congruence Theorem for Ovaloids

1. The Second Fundamental Forms of Isometric Surfaces

2. Nets of Curves and their Singularities

3. The Main Theorem

IX. Singularities of Surfaces with Constant Negative Gauss Curvature

1. Singularities

2. Tschebyscheff Nets

3. The Main Theorem

4. Further Details and Generalizations