Freie Universität Berlin WiSe 17/18
Institut für Mathematik
Prof. Dr. K. Polthier, H.-S. Lipschütz Status: December 11, 2017

Differential Geometry I – Homework 07

Submission: December 18, 2017, 12:15 am

---

1. Exercise (8 points)

Let

$$f : \mathbb{R} \times \mathbb{R} \to \mathbb{R}^3,\ (u, v) \mapsto (u - \frac{u^3}{3} + uv^2, v - \frac{v^3}{3} + vu^2, u^2 - v^2).$$

Then f parametrizes the *Enneper surface.*

1.) Show that for f a *Weierstraß parametrization* is given by $F(z) = 1$ and $G(z) = z$.

2.) Show that all surfaces of the associate family $(e^{i\varphi}F, G)$, $\varphi \in [0, 2\pi)$, are intrinsically isometric and congruent in $\mathbb{R}^3$.

2. Exercise (4 points)

1.) Determine the Gauß curvature of the Lobachevski plane.

2.) Show that all geodesics in the Lobachevski plane have got infinite length.

3. Exercise (4 points)

Show: if all geodesics of a connected surface are planar curves then the surface is contained in a plane or a sphere.

Total: 16