
Homework 3
Due: Friday, February 12

1. *Orientation* A Möbius strip S in \mathbb{R}^3 can be parametrized as

$$W \xrightarrow{G} \mathbb{R}^3 \{(u, v) : u \in [0, 2\pi], v \in [-1, 1]\}$$
$$(u, v) \longmapsto (G_1(u, v), G_2(u, v), G_3(u, v))$$

where

$$G_1(u, v) = \left(1 + \frac{1}{2}v \cos\left(\frac{1}{2}u\right)\right) \cos(u)$$
$$G_2(u, v) = \left(1 + \frac{1}{2}v \cos\left(\frac{1}{2}u\right)\right) \sin(u)$$
$$G_3(u, v) = \frac{1}{2}v \sin\left(\frac{1}{2}u\right)$$

(a) Verify that $G(0, 0) = G(2\pi, 0)$.

Now attempt to assign an orientation using $\tau_1 = \frac{\partial}{\partial u}G$, $\tau_2 = \frac{\partial}{\partial v}G$.

(b) Use this to compute the normal vector at $G(0, 0)$.

(c) Use this to compute the normal vector at $G(2\pi, 0)$.

2. [F] 5.5.2

3. [F] 5.5.3

4. [F] 5.8.1

5. [F] 5.8.3