Freie Universität Berlin WiSe 18/19
Institut für Mathematik
Prof. Dr. K. Polthier, H.-S. Lipschütz Status: November 30, 2018

Differential Geometry III – Homework 06

Submission: December 12, 2018, 12:15 am

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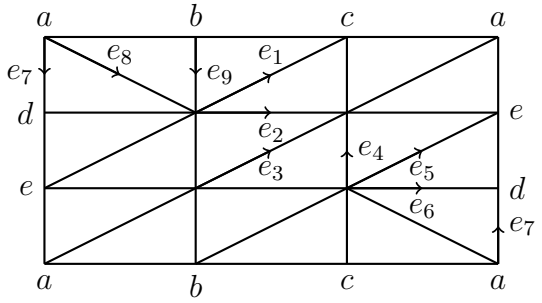
1. Exercise (4 points)

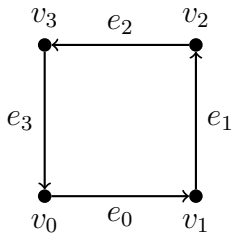
Consider the following representation of the Klein bottle K:



Show that the *second cohomology group* $H^2(K)$ is nontrivial. Therefore orient the 2-simplices mathematically positive.

2. Exercise (4 points)

Consider the following oriented simplicial complex K:



Determine its *first cohomology groups* $H^0(K)$ and $H^1(K)$. In both cases, determine set of generators. Can your result be applied to an n-gon (i.e. for $V = \{v_0, \dots, v_{n-1}\}$, you have $n-1$ oriented edges of the form $e_i = [v_i, v_{i+1}]$, $0 \leqslant i < n-1$, and $e_{n-1} = [v_{n-1}, v_0]$)?

Total: 8