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Differential Geometry III – Homework 05

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1. Exercise (4 points)

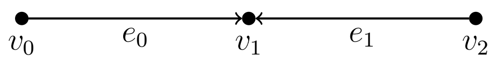
Show the following lemma from the lecture:
Let L be a complex in a rectangle and let BdL the 1-complex consisting of the edges in the boundary of the rectangle. Further, let all 2-cells be oriented positively and let all 1-chains be oriented arbitrarily. Then

1.) Every 1-cycle in L is homologous to a 1-cycle in BdL.

2.) If d is a 2-chain in L and ∂d is in BdL, then d is a multiple of the chain $\sum_i \sigma_i$ where σ_i runs through all 2-cells.

2. Exercise (4 points)

Consider the following oriented simplicial complex K:



Let $(G, \star) = (\mathbb{Z}/2\mathbb{Z}, +)$. Determine a coboundary operator

$$C^1(K,G) \xleftarrow{\delta_0} C^0(K,G)$$

explicitly. Is it unique?

Total: 8