Needham, VDGAF, Chapter 20, Exercise 31, p. 227
Palmer, August 24 , 2023, 5:10 pm PST

31. Existence of the Stiefel Vector Field*. Explain, as explicitly as possible, why the construction is guaranteed to create a consistent vector field on S_g, regardless of the specific partition into polygons.*

It is given that a sphere has genus 0. With the correspondences of vertex to source, edge to saddle, and face to sink, we can rewrite the equation for Euler's Characteristic as

$$\chi = \text{sources} - \text{saddles} + \text{sinks} = 2 - 2g = 2$$

The construction always produces a vector field consistent with this result, regardless of the specific partition into polygons.