CSC 565 2020 Fall Homework 4

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You can create a latex project of this homework through this link.

Simplicial Maps and Contractions

1. Give a contraction C_5 to C_3.

Answer:

2. Give a surjective simplicial map C_5 to C_3 that is *not* a contraction.

Answer:

Contracting Edges in Planar Graphs

3. Let G be a planar graph with n vertices, m edges, and f faces. Let $e \in E_G$ be an edge of G. How many vertices, edges, and faces can $G' = G/e$ have? This is the graph G with the edge e contracted. Please give your answer as a collection of (n', m', f') triples.

Answer:

Forbidden Minors

4. Let $H_0, \ldots, H_{k-1}$ be a set of graphs. Let S be the set of graphs G such that for all $i \in [k]$,

$$H_i \not\preceq_M G.$$

Let $G \in S$ and let G' be a minor of G. Prove that $G' \in S$.

Answer:

Planar 3-connected graphs

5. Let G be a planar 3-connected graph. Let $H = G + e$ still be a planar graph where e is an edge. Show that H^* contracts to G^*. Note that H^* is the dual of H.

Answer: