Illinois Institute of Technology
Department of Computer Science

Homework Assignment 8

CS 430 Introduction to Algorithms
Spring Semester, 2018

Due: Wednesday, April 18

1. Problem 34.4-3 on page 1085

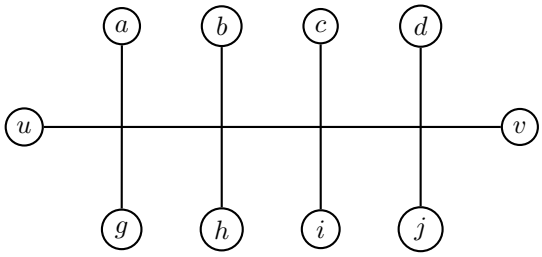
2. Problem 34.4-7 on page 1086

3. As described in class on April 11, use the crossover gadget on page 7 of the lecture slides to reduce the 3-colorability for arbitrary graphs to 3-colorability for *planar* graphs; that is, prove that 3-colorability of *planar* graphs is NP-hard:

   (a) Prove that in any legal 3-coloring of the crossover gadget, the opposite corners are forced to have the same color.

   (b) Prove that any assignment of colors to the corners such that opposite corners have the same color extends to a legal 3-coloring of the entire crossover gadget.

   (c) Use the following idea to prove that 3-colorability of *planar* graphs is NP-hard: Replace each point at which another edge crosses edge (u, v) with a copy of the crossover gadget G. For example, replace



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