Illinois Institute of Technology
Department of Computer Science

Homework Assignment 9

CS 430 Introduction to Algorithms
Spring Semester, 2016

Due: Monday, April 25

1. The greedy coloring of a graph $G = (V, E)$ is the coloring obtained by taking the vertices V in sequence, assigning to each the first available color c_k. Show that the greedy coloring of a graph does not approximate the optimal coloring to within any constant ratio.

   (*Hint*: Consider a bipartite graph of vertices $a_1, a_2, \ldots, a_n$ and $b_1, b_2, \ldots, b_n$ with edges (a_i, b_j) for all $i \neq j$.)

2. Show that for any graph $G = (V, E)$ there is an ordering of the vertices such that the greedy algorithm yields an optimal coloring.

3. Prove that it is NP-complete to determine that optimal ordering.