CS 2802: Homework 13

December 6, 2020

Handed out Dec. 7, due Dec. 15, 5 PM. This is the last homework :-) Note that I've given you an extra day to do it, since it's possible I won't cover everything until Dec. 14 (although I'll try to by Friday, Dec. 11). Everything covered by this exam is fair game for the final.

- (Re)read Chapter 3 and read Chapter 12 in MCS
- Do the following problems:
  - 3.27 (It's enough to say "equivalent" or "not equivalent" here.)
  - 3.28
  - 3.30
  - 3.36 (Provide a careful proof of (e)!)
  - 3.45
  - 3.48(a)
  - 3.50
  - 12.4(a),(b),(d)
  - 12.8
  - 12.10
  - 12.23
  - 12.24
  - 12.50(a)
  - Additional problem: A zoo wants to set up natural habitats in which to exhibit its animals. Unfortunately, some animals will eat some of the others when given the opportunity. How can a graph model and a coloring be used to determine the number of different habitats needed and the placement of the animals in these habitats?

– Challenge problem (you don't have to hand this in): (Adapted from *What is the Name of This Book?*, by Raymond Smullyan.)

  Suppose that on an island there are three types of people: knights, knaves, and normals. Knights always tell the truth, knaves always lie, and normals sometimes lie and sometimes tell the truth. Detectives questioned three inhabitants of the island–Amy, Brenda, and Claire–as part of the investigation of a crime. The detectives knew that one of the three committed the crime, but not which one. They also knew that the criminal was a knight, and that the other two were not. Additionally, the detectives recorded these statements: Amy: I am innocent. Brenda: What Amy says is true. Claire: Brenda is not a normal. After analyzing their information, the detectives positively identified the guilty party. Who is the guilty party? (You should be able to express all the information using propositional logic and reason to the conclusion in the logic!)

Think about (bt don't hand in) problem 12.31. This is the type of thing that you need to do to show that a problem is NP-complete. If you take CS 4820, you'll see more of this type of mateiral.

For recitation: 3.28, 3.45, 12.8, Additional problem (if there's time)