Illinois Institute of Technology
Department of Computer Science

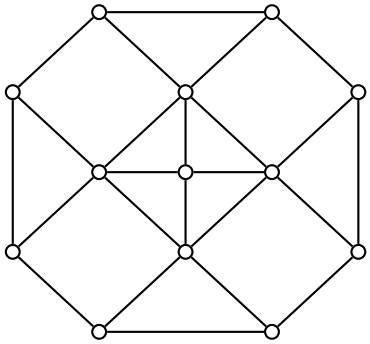
Homework Assignment 11

CS 535 Design and Analysis of Algorithms
Fall Semester, 2016

Due: Thursday, November 10, 2016

Remember the Honesty Pledge!

1. **PhD Qualifying Exam Section Problem 11.** 34.1-6 on page 1061 of CLRS3
2. 34.4-7 on page 1086 of CLRS3
3. (a) Label all the variables, operators, and clauses in Figure 10 in the Tipover article.
   (b) Draw a Tipover diagram for the 3-SAT expression $(a \vee \bar{b} \vee c) \wedge (b \vee d \vee \bar{e})$.
4. Prove the claim on page 3 of the graph coloring slides (regarding the colorability of the "or" gadget).
5. Use the following crossover gadget to prove that determining whether a *planar* graph is 3-colorable is an NP-complete problem:



(*Hint*: Show that the gadget can be 3-colored, then use it to replace pairs of edges that cross in a planar embedding.)