

HW 10 CMSC 452. Morally DUE Apr 29

(I know that is short notice, so the HW will be short.)

1. (0 points) What is your name? Write it clearly. Staple your HW. When is the Final?
2. (0 points but DO IT) READ my notes on P and NP up to but this time INCLUDING the section on the Polynomial Hierarchy.
3. (50 points) Let $(3, 4)$ -programming be the following problem: Given a set of linear constraints in n variables.

(e.g., if $n = 3$ then

$$x_1 + 2x_2 + 7x_3 \leq 14$$

$$-3x_1 + 18x_2 - 83x_3 \leq -18$$

)

is there a vector (x_1, \dots, x_n) where **all of the entries are 3's or 4's** that satisfy the constraints.

Formally the problem is determining membership in the set of all (A, b) where A is a matrix of integers, b is a vector of integers, and there exists a vector x of all 3's and 4's such that $Ax \leq b$. (Note that the matrix need not be square.)

SHOW THAT $SAT \leq (3, 4)$ -PROGRAMMING. (DO NOT use 0-1 programming).

4. (0 points, NOT because its not important, but because the HW is being given on short notice) THINK ABOUT the problem above but instead of 3, 4 any pair of integers.
5. (50 points). For all a let COL_a be the set of graphs that are a -colorable. For each of the following say if its TRUE or FALSE or UNKNOWN TO SCIENCE and why.
 - (a) For all $3 \leq a < b$, $COL_a \leq COL_b$.
 - (b) For all $3 \leq a < b$, $COL_b \leq COL_a$.
 - (c) For all $a \geq 3$, $COL_2 \leq COL_a$.
 - (d) For all $a \geq 3$, $COL_a \leq COL_2$.