Math/CCS 103 Professor: Padraic Bartlett

Homework 3: Presentations from Week 1

Due Friday, week 2 *UCSB 2014*

Homework Problems.

Pick **two** of the following **three** problems to solve!

1. (Nick's problem.)

   (a) Explain why the grid below cannot be a starting grid for method Nick showed for completing Latin rectangles:

$1'$	$2'$	$3'$	$4'$
X_1	X_1	1	1
2	X_2	2	X_2
X_3	X_3	X_3	3
4	4	X_4	X_4

   (b) Complete the following Latin rectangle using this method:

2	4	5	1	3
3	5	4	2	1

   Use the following three tables:

$1'$	$2'$	$3'$	$4'$

$1'$	$2'$	$3'$	$4'$

$1'$	$2'$	$3'$	$4'$

   (c) What is the run-time of this algorithm for an nxn Latin square with r filled rows?

2. In class, we defined the game Sim, which was a 2-player game on a set of six vertices. We proved that this game never ends in a draw. Suppose that you are playing this game, and you get to choose whether you go first or second. Which should you pick if you want to win? Why? Can either player guarantee that they will always win?

3. (a) Find $R(3, 4)$: i.e. find the smallest value of n such that any two-coloring of K_n gives you either a red triangle or a blue K_4.

   (b) Suppose you are playing a "handicapped" version of Sim, where the red player is trying to avoid making a red triangle and the blue player is trying to avoid making a blue K_4. In part (a), you found a value n such that games of this handicapped version on n vertices are guaranteed to not end in a draw. Suppose you play this game on $n-1$ vertices. Can the red player force a victory? Or can the blue player force a draw?