UNIVERSITY OF CALIFORNIA, BERKELEY

DEPARTMENT OF STATISTICS

STAT-155: Game Theory

Fall 2013

Instructor: Antar Bandyopadhyay

GSI: Sujayam Saha

Assignment # 4

Date Given: September 30, 2013 (Monday) **Total Points: 20**
Date Due: October 07, 2013 (Monday)

1. Consider the following Combinatorial Game

   - The game starts with a 8×8 standard *chess board* with 16 rooks placed on the 16 diagonal squares each containing exactly one rook.
   - There are two players, namely, Players I and II who alternate their moves.
   - At each move a player selects one of the 8 rows and moves a rook in it to a square to its right. Note in a move only one rook is moved and it always moves to its right. In other words rooks DO NOT change their respective rows. Also note that a square may have more than one rook in it and no rook is allowed to go out of the board.
   - The game ends when all the 16 rooks are at the right-most column of the board with each right-most square contains two rooks. The last player to make a move is the winner.

   For the above game analyze who will be the winner. Give reasons for your answer.

2. Let G_1, G_2, G_3 and G_4 be four *progressively bounded impartial combinatorial* games with positions g_1, g_2, g_3 and g_4 respectively. Suppose $(G_1, g_1) \sim (G_2, g_2)$ and $(G_3, g_3) \sim (G_4, g_4)$.

   (a) Show that $(G_1 + G_3, (g_1, g_3)) \sim (G_2 + G_3, (g_2, g_3))$.

   (b) Show that $(G_1 + G_3, (g_1, g_3)) \sim (G_2 + G_4, (g_2, g_4))$.