MA152 Spring 2017

Review

9th June

1. Let G_1 be the subtraction game where players may remove 2 or 3 coins, and where there are currently 10 coins. Let G_2 be Nim with piles $(1, 11, 23)$. Find the Sprague–Grundy value of $G_1 + G_2$

2. Consider the combinatorial game where there are piles of coins, and on your turn you may remove any positive number of coins *or* split a pile of size x into x piles of size 1. Find the Sprague–Grundy values when there is a single pile with at most 10 coins.

3. Solve the game
$$\begin{pmatrix} 3 & 0 & 1 & 0 \\ 0 & 9 & 3 & 0 \\ 0 & 0 & 1 & 2 \end{pmatrix}$$

4. In *two different ways* find the value of the game
$$\begin{pmatrix} 3 & 1 & 2 \\ 1 & 3 & 2 \\ 2 & 2 & 2 \end{pmatrix}$$

5. Consider the following zero-sum game. There is a deck of cards, where one quarter of the cards are "hearts". Player I publicly announces either "hearts" or "not hearts". Then a random card from the deck is shown to Player I, but not Player II. Player II then guesses whether the card shown to Player I matches what Player I announced at the beginning. If Player II guesses correctly they win 1, otherwise they lose 1.

   (a) Draw the extensive form of this game.

   (b) Convert this to strategic form.

6. Consider the bimatrix game

$$\begin{pmatrix} (1,1) & (7,1) \\ (4,4) & (5,2) \end{pmatrix}$$

(a) Find the TU solution.

(b) Find the NTU solution if the threat point is $(1,1)$.