

GAMES COURSE

HOMEWORK 3

1. (10 points) Staple the HW and put your NAME on it clearly.
2. (30 points)
 - (a) For $(1, 5, 6)$ -NIM calculate the Grundy numbers for $n = 0, 1, \dots$ until you spot a pattern. State the Grundy function (using MOD notation).
 - (b) For $(1, 4, 7)$ -NIM calculate the Grundy numbers for $n = 0, 1, \dots$ until you spot a pattern. State the Grundy function (using MOD notation).
 - (c) For $(1, 2)$ -NIM calculate the Grundy numbers for $n = 0, 1, \dots$ until you spot a pattern. State the Grundy function (using MOD notation).
3. (30 points) Consider the 3-pile NIM game where pile ONE is $(1, 5, 6)$ -NIM, pile TWO is $(1, 4, 7)$ -NIM, and pile THREE is $(1, 2)$ -NIM.
 - (a) For each of the following starting positions say who wins player I or player II. If it is player I then tell us ALL of the moves that are winning moves for him. $(10, 11, 12)$, $(10, 14, 20)$, $(10, 16, 25)$, $(11, 13, 17)$, $(12, 14, 18)$, $(10, 100, 1000)$,
 - (b) Present an infinite number of ordered triples from which player I wins.
 - (c) Present an infinite number of ordered triples from which player II wins.
4. (30 points)
 - (a) Come up with a TRICK for determining what a number is congruent to mod 13.
 - (b) Use the TRICK to determine what each of the following numbers is congruent to mod 13 (without doing the division).
 - i. 98769181091831234568
 - ii. 12345698765434567890.