

# Math 105: Finite Mathematics

Homework 7 : Due April 1st, 2008

March 26, 2008

Remember, show your work for full credit on all problems.

## 1 Nim

### 1.1

You are playing Nim and it is your turn. There are four piles, with sizes 23, 4, 18 and 1.

#### 1.1.1

What is the binary representation of each of the piles?

#### 1.1.2

Calculate the nim sum for these piles. Is it zero?

#### 1.1.3

If the nim sum is zero, what move should you make?

### 1.2

You are playing Nim and it is your turn. There are three piles, with sizes 23, 4, 7.

#### 1.2.1

What is the binary representation of each of the piles?

### 1.2.2

Calculate the nim sum for these piles. Is it zero?

### 1.2.3

If the nim sum is zero, what move should you make?

## 2 Combinatorial Games

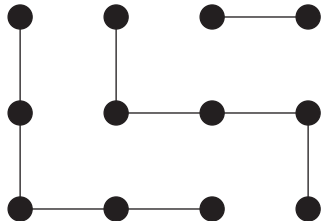
### 2.1

Research the game Connect Four on the Internet. Is it solved? If so, which player is guaranteed to win? If not, discuss the current progress in the field.

### 2.2

Research the game of Chess on the Internet. Is it solved? If so, which player is guaranteed to win? If not, discuss the current progress in the field.

### 2.3



It is your turn in the above game of Dots and Boxes. What move should you make to guarantee you win, and how should you play subsequently? (You do not need to describe every possible situation, only a general strategy.)

2.4

X	O	X
	X	O
O		

Draw the game tree for Tic-Tac-Toe, starting with the above position, and given that it is X's turn. What is the best outcome of this position for X?