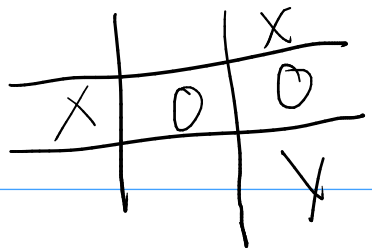


Combinatorial Game Theory

1 2 3 4 5 6 7 8 9

1st to have 3 #'s add up to 15

1 2 3 4 5 6 7 8 9

Magic Square

isomorphic

8	1	6
3	5	7
4	9	2

Nim

1 2 3 4 5 6 7 8 9

9 #'s cross off 1 or 2 each time
last to move wins

1 2 3

1

1 2

1 2 3 4

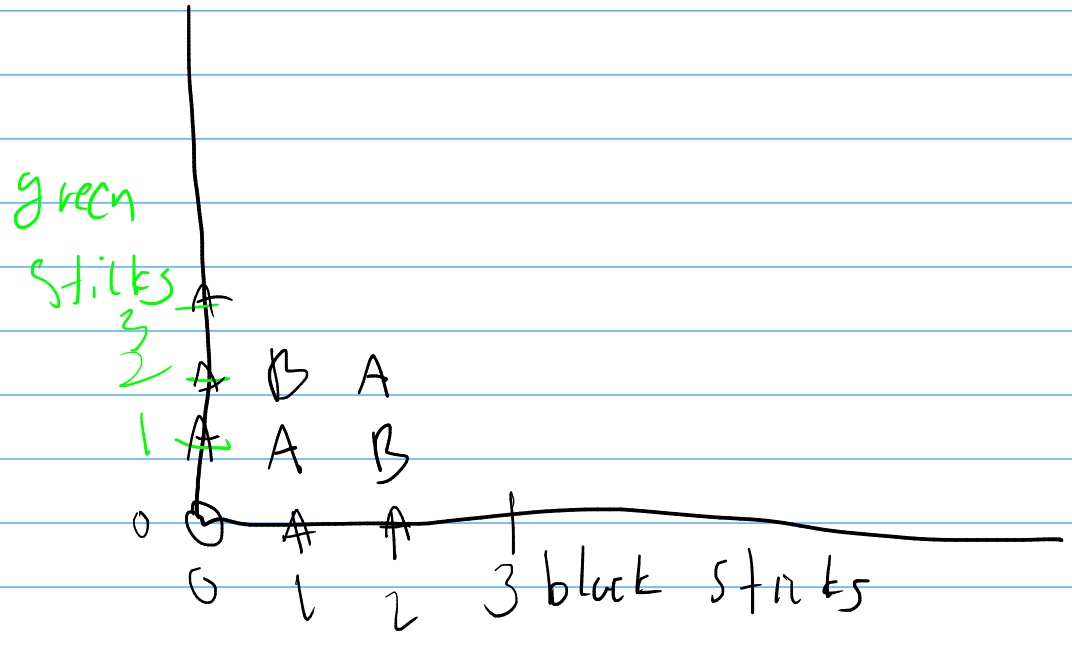
1 . . . n nim games where multiple of n+1 force a win for player 2, otherwise player 1

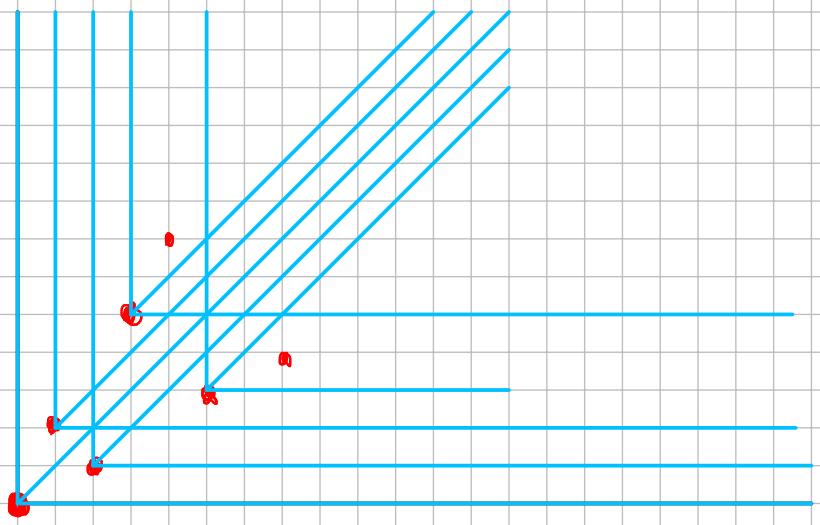
Wythoff's game

| | | | | | | | | | | | |

1. any # of sticks from pile #1
2. any # of sticks from pile #2
3. an equal number from both piles

| | | |





n_k , m_k

$n_k = [\![k\phi]\!]$

$m_k = [\![k\phi^2]\!]$

impartial games

"normal play condition" - Whoever moves last wins

"nimber"

MANIAC

Surreal numbers

"Transcendental number"

$4\left(\frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} \ldots\right)$

John Conway

$\underbrace{\frac{1}{2}}_{} + \underbrace{\frac{1}{3} + \frac{1}{4}}_{7\frac{1}{2}} + \underbrace{\frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \frac{1}{8}}_{7\frac{1}{2}}$

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \frac{1}{11}$$