

## Problem 1 of 5

Find the Sprague-Grundy function for the subtraction game with subtraction set  $\{1, 3, 6\}$ . Justify your answer.

## Problem 2 of 5

Consider the take-away game with the rule that you may remove any number of chips not divisible by three. Find the formula for Sprague-Grundy function.

## Problem 3 of 5

A crippled queen game is played on the board of the size  $2 \times n$ ,  $n \in \mathbb{N}$ . Find a formula for Sprague-Grundy function. Justify your answer.

## Problem 4 of 5

The game is played by the following rules. There are four piles of chips. Players can take any number of chips from any of the first two piles or any number of chips not divisible by three from the third or fourth pile. Find the Sprague-Grundy function of the initial position  $(51, 27, 17, 49)$ . Justify your answer.

## Problem 5 of 5

The **Game of Y** is played on a triangular board tiled with hexagons. As in Hex, the two players take turns coloring in hexagons, each using his assigned color. A player wins when he establishes a  $Y$ , a monochromatic connected region in his color that meets all three sides of the triangle. Please look at Karlin-Peres book, page 25, for a picture. Prove that the first player has a winning strategy.