

MATH 113: DISCRETE STRUCTURES
HOMEWORK DUE FRIDAY WEEK 6

Problem 1. A *binary string* of length n is a word $a_1 \dots a_n$ where $a_i \in \{0, 1\}$ for each i . For instance, 101 is a binary string of length 3. Let X_n be the set of binary strings of length n that do not contain an odd number consecutive 1s. For instance, $101 \notin X_3$.

(1) Find X_i for $i = 1, 2, 3, 4, 5$. (You will notice a connection with the Fibonacci sequence.)

(2) Give a combinatorial explanation for the recurrence $|X_n| = |X_{n-1}| + |X_{n-2}|$.

Problem 2. Use induction to prove that F_{3n} is even for all $n \geq 0$.