# Lecture 21: Fibonacci numbers — Math 345

Thursday, October 28, 2010 — Jim Fowler

## Textbook

This lecture discusses section 5 of the textbook.

## Homework

The homework is due Tuesday, November 2, 2010. From Section 5 of the textbook, do exercise 22.

## fibonacci numbers

every third fibonnaci number is odd.

more generally, every $k$-th number is a multiple of $F_k$

periodic mod $n$.

every number can be written as a sum of fibonacci numbers, using each number at most once

$F_k$ is the number of sequences of 1s and 2s that add up to $k-1$.

$F_{2n} = {F_{n+1}}^2 - {F_{n-1}}^2$.

Fibonacci primes with thousands of digits have been found, but it is not known whether there are infinitely many.

144 is the only nontrivial square Fibonacci number.

### connection to pascal's triangle?

## calculus of finite differences

a dictionary for translating calculus to sums and back again.

e.g., how to compute $\sum_{k=0}^{n} k^2$ via the calculus of finite differences.