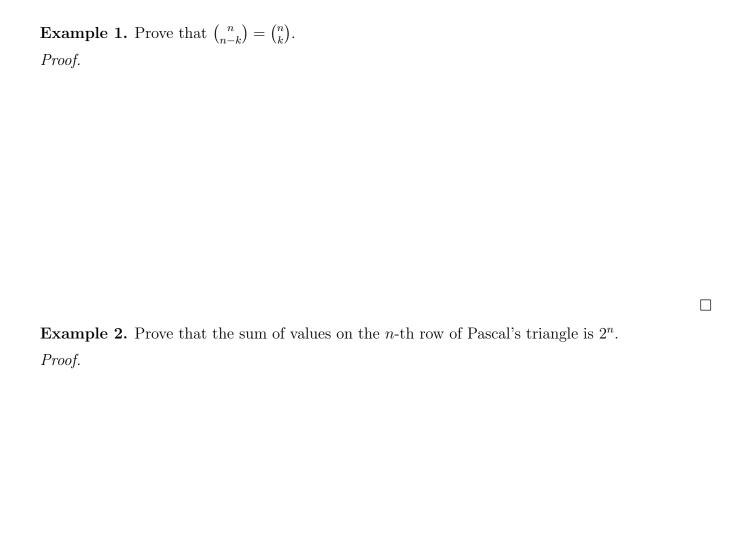
## MATH 2001 BINOMIAL COEFFICIENTS



**Example 3.** Prove that the sum of values on the *n*-th shallow diagonal is the *n*-th Fibonacci number.

Proof.

**Example 4.** Prove that the alternating sum of values on the n-th row of Pascal's triangle is 0. Proof.

Homework. Four proofs due 6pm on Tuesday, October 27.

- Prove that if a, b, c ∈ N and c ≤ b ≤ a, then (<sup>a</sup><sub>b</sub>)(<sup>b</sup><sub>c</sub>) = (<sup>a</sup><sub>b-c</sub>)(<sup>a-b+c</sup><sub>c</sub>).
  Prove that ∑<sup>n</sup><sub>j=0</sub> ∑<sup>j</sup><sub>k=0</sub> (<sup>j</sup><sub>k</sub>) = 2<sup>n+1</sup> 1. In other words, prove that the sum of all values in the first n rows (row 0 up to row n) is equal to 2<sup>n+1</sup> 1.
- (3) Prove that  $\sum_{k=0}^{n} {n \choose k}^2 = {2n \choose n}$ .

Suggested reading: Chapter 3.