

## CSE 390z: Mathematics for Computation Workshop

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### QuickCheck: Induction Proofs (due Monday, February 12)

Please submit a response to the following questions on Gradescope. We do not grade on accuracy, so please submit your best attempt. You may either typeset your responses or hand-write them. Note that hand-written solutions must be legible to be graded.

We have created [this template](#) if you choose to typeset with Latex. [This guide](#) has specific information about scanning and uploading pdf files to Gradescope.

#### 0. Weak Induction, Strong Induction, ...What's The Difference?

Recall that the  $n$ th Fibonacci Number is given by:

$$f(n) = f(n-1) + f(n-2)$$

for all natural numbers  $n \geq 2$ , where  $f(0) = 0, f(1) = 1$ .

Prove that  $f(n) \leq 2^n$  for all  $n \in \mathbb{N}$ .

(a) Prove this using *weak induction*.

**Note:** You may find the following observation useful for the inductive step:

$$f(n+1) = f(n) + f(n-1) \leq f(n) + f(n) = 2 \cdot f(n)$$

(b) Prove this using *strong induction*.

(c) How are the weak and strong induction proofs the same? What parts are different?

#### 1. Video Solution

Watch [this](#) solution video **after** making an initial attempt. Then, answer the following questions.

(a) What is one thing you took away from the video solution?

(b) What topic from the quick check or lecture would you most like to review in workshop?