Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 9 10 11 12 1 2 3 4 5 6

(18 points) Recall that F_n is the nth Fibonacci number, and these start with $F_0 = 0$, $F_1 = 1$.

Let T_n be the number of bit strings of length n that don't contain any consecutive zeros. E.g. when counting strings of length 6, we include 010110, but not 101001. Prove that $T_n = F_{n+2}$ for any natural number n. Hint: if w is a string with no consecutive zeros, either $w = 1x$, where x is a shorter string, or $w = 01y$, where y is a shorter string.

The induction variable is named _____ and it is the _____ of/in the string.

Base Case(s):

Inductive Hypothesis [Be specific, don't just refer to "the claim"]:

Inductive Step:

CS 173, Spring 18 Examlet 9, Part B

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1. (8 points) Here is a grammar with start symbol S and terminal symbol a. Draw three parse trees for the string `aaaaaa` that match this grammar.

$$S \;\rightarrow\; S\ S \;\mid\; a\ S\ a \;\mid\; a\ a$$

2. (4 points) Check the (single) box that best characterizes each item.

Total number of leaves in a 3-ary tree of height h	3^h ☐	$\leq 3^h$ ☐	$\frac{1}{2}(3^{h+1}-1)$ ☐	$3^{h+1}-1$ ☐
The level of a leaf node in a tree of height h.	0 ☐	1 ☐	$h-1$ ☐	$\leq h$ ☐	h ☐