

## CSE 390Z: Mathematics for Computation Workshop

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### QuickCheck: 6. Structural Induction (due Tuesday, February 17th)

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. How Many Ones?

The set  $T$  is defined as follows:

- Base case:  $\epsilon \in T$
- Recursive Rules:
  - If  $x \in T$ , then  $11x \in T$
  - If  $x \in T$  and  $y \in T$ , then  $x0y \in T$

Given the following recursively defined function

- $\text{numOnes}(\epsilon) = 0$
- $\text{numOnes}(11x) = 2 + \text{numOnes}(x)$
- $\text{numOnes}(x0y) = \text{numOnes}(x) + \text{numOnes}(y)$

Prove that for all strings  $n$  in  $T$ ,  $\text{numOnes}(n)$  is even

Hint: In structural induction, the structure of your induction mirrors the recursive definition.

#### 1. Video Solution

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

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