CS 222 Score: /24

Name: _____

Homework 6: Methods of Proof (Contradiction, Induction)

Due date: Friday 3/26/2021 Submit the assignment via Canvas Assignments. Upload homework as one pdf document. A scanner app like Cam Scanner will make this possible. Any HW submitted after the due date will receive a penalty.

Print and write work on this worksheet. Write clearly and show **all** work for full credit.

1. The Fibonacci sequence are natural numbers obtained by summing the two preceding numbers in the sequence. Let F be the set of Fibonacci numbers, typically given by $F = \{1, 1, 2, 3, 5, 8, 13, 21, \dots\}$. Prove F is infinite (using proof by contradiction): (6 points)

$$\mathbb{P}\colon\ \nexists n \in \mathbb{N}, |F| = n$$

2. Prove by contradiction, If the square of an integer is even, the integer is even. (6 points)

3. Prove by induction. (6 points)

$$\mathbb{P}\text{: } \forall n \in \mathbb{N}, \exists m \in \mathbb{N}, n^3 + 2n = 3m$$

4. Prove by induction. (6 points)

$$\mathbb{P}: \ \forall n \in \mathbb{N}, a \neq 1, a^0 + a^1 + \cdots + a^n = \frac{a^{n+1} - 1}{a - 1}$$