## In-Class Worksheet

## Discrete Math \& Functional Programming- CSCI 054- Spring 2024 Instructor: Osborn

Let $T(n)$ be the number of filled triangles in a Sierpinski's triangle after $n$ interations where $T(0)$ is a single filled triangle. Observe that $T(n)=3 T(n-1)$

Use induction to prove that $T(n)=3^{n}$.

Consider the recurrence relation:

$$
\begin{aligned}
& T(n)=5 T(n-1)-6 T(n-2) \\
& T(0)=2 \\
& T(1)=5
\end{aligned}
$$

Claim: $\forall n \in \mathbb{Z}_{0}^{+}: T(n)=2^{n}+3^{n}$

- We prove the claim using a proof by strong induction on:
- Base case(s):
- Inductive hypothesis (IHOP):
- Inductive step:
- We want to show that:
- Proof:
- Therefore by the principle of mathematical induction:

