CMPSC 360 Discrete Mathematics for Computer Science
Fall 2024 Mahfuza Farooque

Worksheet 9

1. **Induction:** Using induction, prove that $\forall n \in \mathbb{N}$, $x^{2n} - y^{2n}$ is divisible by $x + y$.

2. **Strong Induction:** Use strong induction to prove the following proposition:

   If $n \in \mathbb{N}$, then $12|(n^4 - n^2)$.

3. **Strong Induction:** Using induction, prove that a rectangular chocolate bar composed of n pieces can be split into individual pieces using at most $n - 1$ breaks for all $n \in \mathbb{N}$.

4. **Number Theory:** Solve the following:

   (a) $18^{10} \bmod 39$

   (b) $8^{176} \bmod 11$

5. **Number Theory:** Solve the following:

   (a) Convert $(354)_{10}$ to base 8.

   (b) Convert $(542)_8$ to base 10.