

Math 206 — Induction

Problem 1. Use induction to prove that for every $n \in \mathbb{Z}^+$

$$\sum_{k=1}^n k = \frac{n(n+1)}{2}.$$

Problem 2. Let $n \in \mathbb{Z}^+$ and let $x_1, \dots, x_n \in \mathbb{R}$. Use induction to prove that

$$|x_1 + \dots + x_n| \leq |x_1| + \dots + |x_n|.$$

Problem 3. Let $x \in (-1, \infty)$. Use induction to prove Bernoulli's inequality: $(1+x)^n \geq 1+nx$ for all $n \in \mathbb{N}$.

Problem 4. Use induction to prove that 8 divides $5^{2^n} - 1$ for all $n \in \mathbb{N}$.