

**MATH310 Homework 2022-07-26**  
**Due Gradescope 11:59pm 2022-07-28**

1. Use induction to prove that for all positive integers  $n$ : [25 pts]

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$$

2. Use induction to prove that for all nonnegative integers  $n$ : [25 pts]

$$3 \mid (n^3 - n)$$

3. Use induction to prove that for all integers  $n \geq 4$ : [25 pts]

$$n^3 \leq 3^n$$

4. Use induction to prove that for all nonnegative integers  $n$ : [25 pts]

$$7 \mid (3^{2n} - 2^n)$$