Grade 11/12 Math Circles
Induction Exercises
November 14, 2012

1. Prove that $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$ for all $n \in \mathbb{N}$.

2. Prove that $n! \geq 2^{n-1}$ for all $n \in \mathbb{N}$.

3. Prove that $2n^3 + 3n^2 + n$ is a multiple of 6 for all $n \in \mathbb{N}$.

4. Prove that $1^3 + 2^3 + 3^3 + \cdots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$ for all $n \in \mathbb{N}$. 