## HOMEWORK 4

1) Prove by induction that $1 + 3 + 5 + \cdots + (2n - 1) = n^2$ for all $n \in \mathbb{N}$.

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

3) Let $x, y \in \mathbb{R}$ and $y \neq 1$. Prove that $x + xy + xy^2 + \cdots + xy^{n-1} = \frac{x(1-y^n)}{1-y}$ for all $n \in \mathbb{N}$.

4) Prove that $n! > 2^n$ for all integers $n \geq 4$.

5) Prove that $3^n > n^2$ for all integers $n \geq 2$.

6) Prove that $81|(10^{n+1} - 9n - 10)$ for every non-negative integer $n$.

7) Text book question 6.21. We did exercise 4.6 in class.

Not collected Book problems: $6.2, 6.5, 6.18, 6.19$