

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 $s, t \in \mathbb{R}$ and $t \neq 1$. Prove that $s + st + st^2 + \cdots + st^{n-1} = \frac{s(1-t^n)}{1-t}$ 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 .

Not collected Book problems: 6.2, 6.5, 6.18, 6.19, 6.21