Practice Assignment 2A

1. Prove that $9^n - 2^n$ is divisible by 7 for all $n \in N$.

2. Prove that $1 + 5 + 9 + 13 + ... + (4n - 3) = \frac{1}{2} n(4n - 2)$.

3. Prove that $\sum_{1}^{n} 10^3 = \frac{10}{9}\left(10^n - 1\right)$.

4. Prove that if $n \in N$, then $2^1 + 2^2 + 2^3 + ... + 2^n = 2^{n+1} - 2$.

5. Prove that if $n \in N$, then $1 \cdot 3 + 2 \cdot 4 + 3 \cdot 5 + 4 \cdot 6 + ... + n(n + 2) = \frac{n(n+1)(2n+7)}{6}$.

6. Prove that $\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + ... + \frac{1}{n^2} \leq 2 - \frac{1}{n}$.

7. Prove that $(1 + 2 + 3 + ... + n)^2 = 1^3 + 2^3 + 3^3 + ... + n^3$ for every $n \in N$.