Homework 2

Due Date: Friday January 20, 2012.

Prove each of the following using Mathematical Induction.

Problem 1. (4 pts.)

\[ 1 + 6 + 11 + 16 + \cdots + (5n - 4) = \frac{n(5n - 3)}{2} \]

Problem 2. (4 pts.)

\[ 4^3 + 4^4 + 4^5 + \cdots + 4^n = \frac{4(4^n - 16)}{3} \]

Problem 3. (4 pts.)

\[ \sum_{i=1}^{n+1} i \cdot 2^i = n \cdot 2^{n+2} + 2, \text{ for all integers } n \geq 0 \]

Problem 4. (4 pts.)

\[ \prod_{i=2}^{n} \left(1 - \frac{1}{i^2}\right) = \frac{n + 1}{2n}, \text{ for all integers } n \geq 2 \]