Math 2534 Homework 5 sec 5.1, 5.2

Problem 1: Verify that \( \sum_{i=1}^{n+1} i(2^i) = (n)2^{n+2} + 2 \) when \( n = 4 \).

Problem 2: Given the recursive sequence \( a_1 = 1, a_2 = 2, a_n = a_{n-1} + 2a_{n-2}, n > 2 \):

a) Give the first six terms in this sequence.

b) Find the sequence function that will give the same results.

Problem 3: If you are given a sequence function \( f(n) = 2n + 1 \), find the recursive sequence that will give you the same results.

Problem 4: Reduce the following factorials.

a) \( \frac{(n-3)!}{(n+4)!} \)

b) \( \frac{(n+3)!}{(n-4)!} \)

Prove the following using PMI

Problem 5: Theorem: \( \forall n \in N, \ 5^n - 1 \) is divisible by 4

Problem 6: Theorem: \( n! > 4^n \) for natural numbers \( n > ? \) (fill missing value for \( n \) before beginning proof)

Problem 7: Theorem: \( \forall n \in N, \ 1 + 3 + 5 + ... + (2n-1) = n^2 \)