1. (5 points) Use mathematical induction to prove the geometric series:
\[
\sum_{i=0}^{N} A^i = \frac{A^{N+1} - 1}{A - 1}
\]

2. (6 points) Write an iterative (i.e., loop-based) function \( \text{Factorial}(n) \) that returns \( n! \). Argue that the function is linear in \( n \).

3. (5 points) Write a recursive function \( \text{Sum}(A, i, j) \) that returns the sum of the integer elements of array \( A \) from \( A[i] \) to \( A[j] \) by dividing the array \( A[i...j] \) in half (if it contains more than one element), calling \( \text{Sum} \) recursively on each half, and then returning the sum of the two recursive calls.

4. (6 points) Exercise 2.1, page 64 of Weiss.

5. (8 points) Exercise 2.7(a), page 64 of Weiss. Only do the first four program fragments. Show your work.