Analysis of Algorithms: Assignment 1

Due date: January 11 (Thursday)

Problem 1

Let $A[1..n]$ be a *sorted* array of n distinct numbers. Write an efficient algorithm BINARY-SEARCH(A, n, k) that finds a given value k in the array $A[1..n]$. The algorithm should return the index of the found element; for example, if $A = \langle 1, 3, 4, 6, 9 \rangle$ and $k = 6$, then the returned index is 4, which means that $k = A[4]$. If the array does not include the value k, the algorithm should return 0.

Problem 2

Prove the following equalities:

(a) $1 + 2 + 3 + 4 + ... + n = \frac{n \cdot (n+1)}{2}$.

(b) $1 + x + x^2 + x^3 + ... + x^n = \frac{x^{n+1} - 1}{x - 1}$ (where $x \neq 1$).