01204313 Algorithms: Homework 1
Deadline: 18 Feb 2019

1. From the definition of the big-O notation we learn in class, Prove that $3n^3+100n^2+5n+1000+10/n^2 = O(n^3)$

2. Consider the following algorithm. What is the goal of the algorithm? What is the asymptotic running time of the following algorithm?

   Input: array $A[1, 2, \ldots, n]$

   ```
   1  b ← A[1]
   2  b₂ ← -∞
   3  for i ← 2, 3, …, n do
   4     if A[i] > b then
   5        b₂ ← b
   6        b ← A[i]
   7     else if A[i] > b₂ then
   8        b₂ ← A[i]
   9     endif
   10 endfor
   11 return b₂
   ```

3. Consider the following algorithm. What is the asymptotic running time of the following algorithm?

   Input: n

   ```
   1  a ← 1
   2  k ← 1
   3  while a ≤ n do
   4     y ← 1
   5     while y ≤ n do
   6        y ← y + k
   7     endwhile
   8     k ← 2k
   9     a ← a + 1
   10 endwhile
   ```