Data Structures Homework 1

基本題(80%)

1. Show that $2n^2 + n\log n = \Omega($). What are the values of c_1, c_2 and n_0 found by you. (20%)

2. Show that $10n^3 + 15n^4 + 100n^2 2^n = O($). What are the values of c and n_0 found by you. (20%)

3. Analyze and give the time complexity of the following program segments in terms of *n*. (20%) Please try to explain your answer. (20%)

(1)
```
for (i=0; i<n; i++)
  for (j=0; j<n; j++)
    for (k=0; k<n; k++)
      c[i][k] = a[i][j] * b[j][k] + c[i][k];
```

(2)
```
for (i=0; i<n; i++)
  for (j=i; j<n; j++)
    for (k=j; k<n; k++)
      c[i][k] = a[i][j] * b[j][k] + c[i][k];
```

進階題(20%)

4.

(1) 令 f1(n)= 100n+2，f2(n)=10n^2+4n+2，f3(n)=6*2n+n2. 請以 Excel 分別輸入不同 n 值，畫出 n 與這三個函式輸出值的圖表。

(2) 請比較這三個函式的成長速率大小。這三個函式的時間複雜度分別為何?

(3) 為何表示一個程式時間複雜度(bigO)的 n 多項式會省略各項的常數值(例如以 O(n^2) 表示而不說是 O(10n2))?

(4) 若一個程式的執行步驟為 f2(n)，為何通常稱此程式為 O(n^2) 而不說是 O(n^2+n))?