Discussion Section 7 (10/09/2008)

1. What is Big-O, Big-Omega, and if applicable, Big-Theta of the following:

$x^2 + 5x$ $x + \log x$ $x + x!$

```
int sum = 0;
for(int i = 0; i < n; i++){
   for(int j = 0; j < n; j++){
      sum = sum + i + j;
   }
}
```

```
int sum = 0;
for(int i = 0; i < n; i++){
   for(int j = 0; j < i; j++){
      sum = sum + i + j;
   }
}
```

2. Search

```
static int search1(int[] l, int e) {
   for (int i = 0; i < l.length; i++) {
      if (l[i] == e) {
         return i;
      }
   }
   return -1;
}
static int search2(int[] l, int e) {
   int start = 0; int end = l.length - 1;
   while (start <= end) {
      int middle = (start + end) / 2;
      if (e < l[middle]) {
         end = middle - 1;
      } else if (e > l[middle]) {
         start = middle + 1;
      } else {
         return middle;
      }
   }
   return -1;
}
static int search3(int[] l, int e, int start, int end) {
   if (start > end) return -1;
   int middle = (start + end) / 2;
   if (e < l[middle]) {
      return search3(l, e, start, middle - 1);
   } else if (e > l[middle]) {
      return search3(l, e, middle + 1, end);
   } else {
      return middle;
   }
}
```

Questions:

a. What's the complexity of all 3 searches?

b. In general, how to analyze complexity?

c. Practically, when do we want solution #1 and when do we want #2 or #3?