Part B – written (Submit as an pdf file, or hand-in in class.)

3. Order following function by growth rate: N, √N, $N^{1.5}$, NlogN, $\log(N^2)$, N^2, 2^N, 300

4. Give a Θ(big Theta) estimation for each of following function t(n).

a. $t(n) = 2^{12}$

b. $t(n) = \log(n^2) + 2(\log n)^2 + (\log(20^2))^2$

c. $t(n) = 3t(n/2) + (n+1)$

d. $t(n) = 2t(n/3) + (n+1)(n-1)$

5. What is the runtime of each method? Give answer in Θ(big Theta) notation as a function of n, give brief explanation.

a.

```
public static int method1(int n){
  int mid = n/2;
  for (int i = mid; i >= 0; i--) System.out.println(i);
  for (int i = mid + 1; i <= n; i++) System.out.println(i);
  return mid;
}
```

b.

```
public static int method2(int n){
  for (int i = n; i >= 0; i / 3){
    System.out.println(i );
  }
  return mid;
}
```

c.

```
public static int method3(int n){
  for (int i = n; i >= 0; i--){
    for (int j = 0, j <= i + i; j++)
      System.out.println(i + j);
  }
  return mid;
}
```

d.

```
public static int method4(int [] a, int start, int end){
  int ans = 0;
  if (start >= end) ans = a[start];
  else {
    int mid = (start + end) / 2;
    int x = method4(a, start, mid);
    int y = method4(a, mid + 1, end);
    print(a, start, end); //print each element in a from start to end
    if (x < y) ans = x;
    else ans = y;
  }
  return ans;
}
public static void print(int [] a, int s, int e){
  for (int i = s; i <= e; i++) System.out.println(i);
}
```