1. Exercise 2.1

$\frac{2}{N}$, 37, $\sqrt{N}$, N, $N\log\log N$, $N\log N$, $N\log^2 N$, $N\log(N^2)$, $N^{1.5}$, N^2, $N^2\log N$, N^3, $2^{\frac{N}{2}}$, 2^N

2. Exercise 2.6

a) 2^{2^N}

b) $O(\log(\log D))$

3. a) $O(N)$

b) $O(N^2)$

c) $O(\log_K N)$

4. Exercise 2.11

a) $O(N) \rightarrow k(100) = 0.5$

$k(500) = 2.5\text{ ms}$

b) $O(N\log N) \rightarrow k(100\log 100) = 0.5$

$k = \frac{0.5}{100\log 100}$

$k(500\log 500) = \frac{0.5(500\log 500)}{100\log 100}$

$= \frac{0.5(5\log 500)}{\log 100}$

$= 3.374\text{ ms}$

c) $O(N^2) \rightarrow k(100^2) = 0.5$

$k = \frac{0.5}{100^2}$

$k(500^2) = \frac{0.5(500^2)}{100^2} = 0.5(25) = 12.5\text{ ms}$

4) Exercise 2.11 cont'd

d) $O(N^3) \rightarrow k(100^3) = 0.5$

$$k = \frac{0.5}{100^3}$$

$$k(500^3) = \frac{0.5(500^3)}{100^3} = 0.5(5^3) = 62.5 ms$$

5) Exercise 2.15

```
int start=0;
int end = array.length-1;
int i;

while (start <= end) {
      i = (start+end)/2;
      if (array[i] >i) {
          end =i-1;
      } if (array[i]<i) {
          start=i+1;
      } else {
          return i;
      }
}
return-1;
```

The runtime of this algorithm is O(logN)