2017-12451 컴퓨터공학부 이홍학 이산수학 과제3

3.1.28 finding x in $(a_1, \cdots, a_n)$

```
i=1, j=n
while (i+3 <= j)
    l=⌊1/4(i+j)⌋, m=⌊1/2(i+j)⌋, u=⌊3/4(i+j)⌋
    if x > a_m then
        if x ≤ a_u then
            i=m+1, j=u
        else i=u+1
    else if x > a_l then
            i=l+1, j=m
        else j=l
if x==a_i then ans=i
else if x==a_j then ans=j
else if x==a_⌊1/2(i+j)⌋ then ans=⌊1/2(i+j)⌋
else ans=-1
return ans (not found=-1, else=location)
```

3.1.44 based on binary search algorithm

$i=1, j=n$

while $(i<j)$

$m=\lfloor\frac{1}{2}(i+j)\rfloor$

if $x>a_m$ then $i=m+1$

else $j=m$

if $x<a_i$ then ans $=i$

else ans $=i+1$

return ans

3.1.56

ex1) 15cent: fewest = 2coins (10+5)

greedy = 4coins (12+1+1+1)

ex2) 29cent: fewest = 3coins (12+12+5)

greedy = 5coins (25+1+1+1+1)

3.2.26

(a) $O(n\log(n^2+1)+n^2\log n)=O(n^2\log n)$

(b) $O(n^2(\log n)^2+2n\log n+1+n^2\log n+n^2+\log n+1)$

$=O(n^2(\log n)^2)$

(c) $O(n2^n+n^{n^2})=O(n2^n)$ $(\because 2^n>n^2)$

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3.2.32

$f(x)=O(g(x)) \rightarrow x>k$ 일 때 $|f(x)| \leq C|g(x)|$ 인 C와 k가 존재

$g(x)=\Omega(f(x)) \rightarrow x>l$ 일 때 $|g(x)| \geq d|f(x)|$ 인 d와 l이 존재

$\rightarrow d=\frac{1}{C}, k=l$ 이면 $f(x)=O(g(x)) \leftrightarrow g(x)=\Omega(f(x))$

3.2.46

$f_1(x)=\Theta(g_1(x)) \rightarrow x>k_1$ 일 때 $|f_1(x)| \geq C_1|g_1(x)|$,

$x>k_2$ 일 때 $|f_1(x)| \leq C_2|g_1(x)|$ 인

C_1, k_1, C_2, k_2 존재

마찬가지로 $f_2(x)$에 대해서 C_1', k_1', C_2', k_2' 존재,

$\therefore |f_1(x)f_2(x)| \geq C_1C_1'|g_1(x)g_2(x)|$ for all $x>\max(k_1, k_1')$,

$|f_1(x)f_2(x)| \leq C_2C_2'|g_1(x)g_2(x)|$ for all $x>\max(k_2, k_2')$

which means $f_1(x)f_2(x)=\Theta(g_1(x)g_2(x))$