Asn 5

3.1

4/ procedure largestDifference($a_1 - a_2, a_2 - a_1, \ldots a_{n-1} - a_n$)
largestDifference := 0
for i := 1 to (n-1)
difference := $a_i - (a_{i+1})$
if difference > largestDifference
largestDifference := difference
{largestDifference has desired value}

10/ procedure x^n ($x \cdot x$ (n times))
procedure x^{-n} ($\frac{1}{x} \cdot \frac{1}{x}$ (n times))
answer := 1
if n := + (positive int)
for i := 1 to n
answer := answer · x
else if n := - (negative int)
for i := 1 to (-1 · n)
answer := answer · $\frac{1}{x}$
else
answer := 1
{answer has desired value}

16/ procedure smallest($a_1, a_2, a_3, a_4, \ldots, a_n$)
smallest := a_1
for i := 2 to n
if smallest > a_i
smallest := a_i
{smallest has desired value}

28) procedure quadsearch(x: integer, $a_1, a_2, \ldots, a_n$: increasing ints)

```
i := 1
j := n
while i < j
    m := ⌊(i+j)/4⌋
    if x > a_m
        i := m+1
    else
        j := m
if x = a_i
    location := i
else
    location := 0
```

{location is the subscript of the term equal to x, or 0 if x isn't found}

30) procedure insertion sort($a_1, a_2, \ldots, a_n$: real numbers with $n \geq 2$)

```
for j := 2 to n
i := j-1
while a_j < a_i
    i := j-1
m := a_j
for k := 0 to j-i-1
    a_{j-k} = a_{j-k-1}
a_i := m
```

{$a_1, a_2, \ldots, a_n$ sorted}

c) $2+3+4+\ldots+t_n = \frac{n^2+n-2}{2}$

d) $n+n-1+\ldots+2 = \frac{n^2+n-2}{2}$

b) 3,2,4,5,1,6 — 2<3
2,3,4,5,1,6 — 4>3, 4>2
2,3,4,5,1,6 — 5>4, 5>3, 5>2
1,2,3,4,5,6 — 1<5, 1<4, 1<3, 1<2
1,2,3,4,5,6 — 6>5, 6>4, 6>3, 6>2, 6>1

S6) 20 coins:

greedy algorithm = 1:12 cent, 1:nickel, 3:pennies (5 coins)

fewest coins = 2: dimes (2 coins)

So, Greedy Alg doesn't produce fewest coins

1) for i:=2 to n (n) n-1 (since i=2)
   if smallest > ai (n)
   [i = n+1] → to exit (1) $2(n-1)+1 = \boxed{2n-1}$

2) for i:= 1 to 4 (4) $\boxed{4^3+2 = O(1)}$
   for j:=1 to 4 (4)
   if aj > aj+1 (4)
   swap aj with aj+1 (+2 to exit)

4) Yes, because you are exponentially cutting your search time for K.

8) a) y=3, i=1, y=7, i=2, y=15

b) n multiplications and n additions

16) O(log n)