Lab 2 A & B

5) D: prove bubble sort is correct

example 3, 2, 5, 4, 7, 1

base case $i = 0$

$i=0$ 2, 3, 5, 4, 7, 1

$i=1$ 2, 3, 5, 4, 7, 1

$i=2$ 2, 3, 4, 5, 7, 1

$i=3$ 2, 3, 4, 5, 7, 1

$i=4$ 2, 3, 4, 5, 1, 7

$i=5$ 2, 3, 4, 5, 1, 7

we are pushing the maximum elements to the last position of the array

So, after i^{th} pass elements of arr $arr[n-1] \dots arr[n-1-i]$ are in their final sorted order

I (i) $arr[n-1] \dots arr[n-i-1]$ are sorted for $0 \le i \le n-1$

hypothesis

assume I(i) holds for $0 < i < n-1$

induction Step

I(i+1) show that this holds

the algorithm will place the large elements among arr[n-i-1] ... arr[0] into position n-i-2

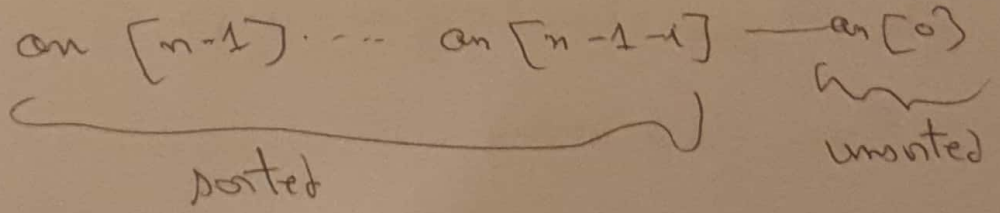
I(i+1): arr[n-i-2] ... arr[n-1] will be in its final sorted order

this shows I(i) is true $0 \leq i \leq n-1$.

E) whenever a pair arr[i] arr[i+1] in $0 \leq i \leq n-1$ in ~~the~~ i'th iteration $0 \leq i \leq n-1$ occurs in inverted ~~border~~ order, ~~so~~ that arr[i] > arr[i+1]

then bubble sort performs comparison and swap

~~after~~ after the i'th step in the outer loop we will have



As bubble sort algorithm attempt to place an element in arr[n-i-2] position it compares element from arr[n-i-1] to arr[0] that will be placed in arr[n-i-2]

there are as many inversions as there are comparisons in this algorithm

bubble sort is inversion bound.

d) ~~please~~ $T(n) = O(n)$