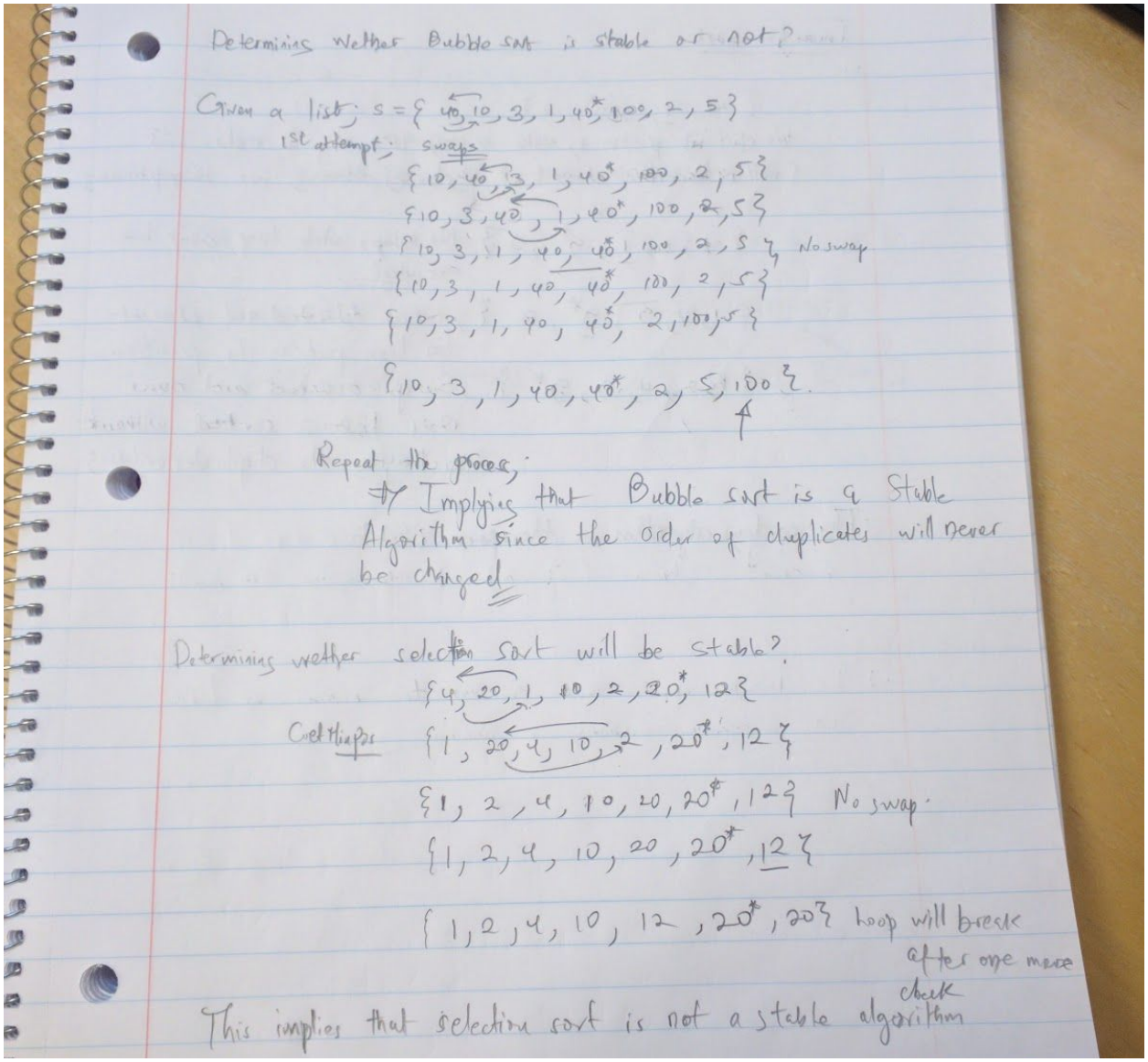
Problem1



Determining Wether Bubble sort is stable or not?

Given a list; $S = \{4, 10, 3, 1, 40^*, 100, 2, 5\}$

1st attempt; swaps

$\{10, 4, 3, 1, 40^*, 100, 2, 5\}$

$\{10, 3, 4, 1, 40^*, 100, 2, 5\}$

$\{10, 3, 1, 4, 40^*, 100, 2, 5\}$ No swap

$\{10, 3, 1, 4, 40^*, 100, 2, 5\}$

$\{10, 3, 1, 4, 40^*, 2, 100, 5\}$

$\{10, 3, 1, 4, 40^*, 2, 5, 100\}$.

Repeat the process;

Implying that Bubble sort is a Stable Algorithm since the order of duplicates will never be changed

Determining wether selection sort will be stable?

$\{4, 20, 1, 10, 2, 20^*, 12\}$

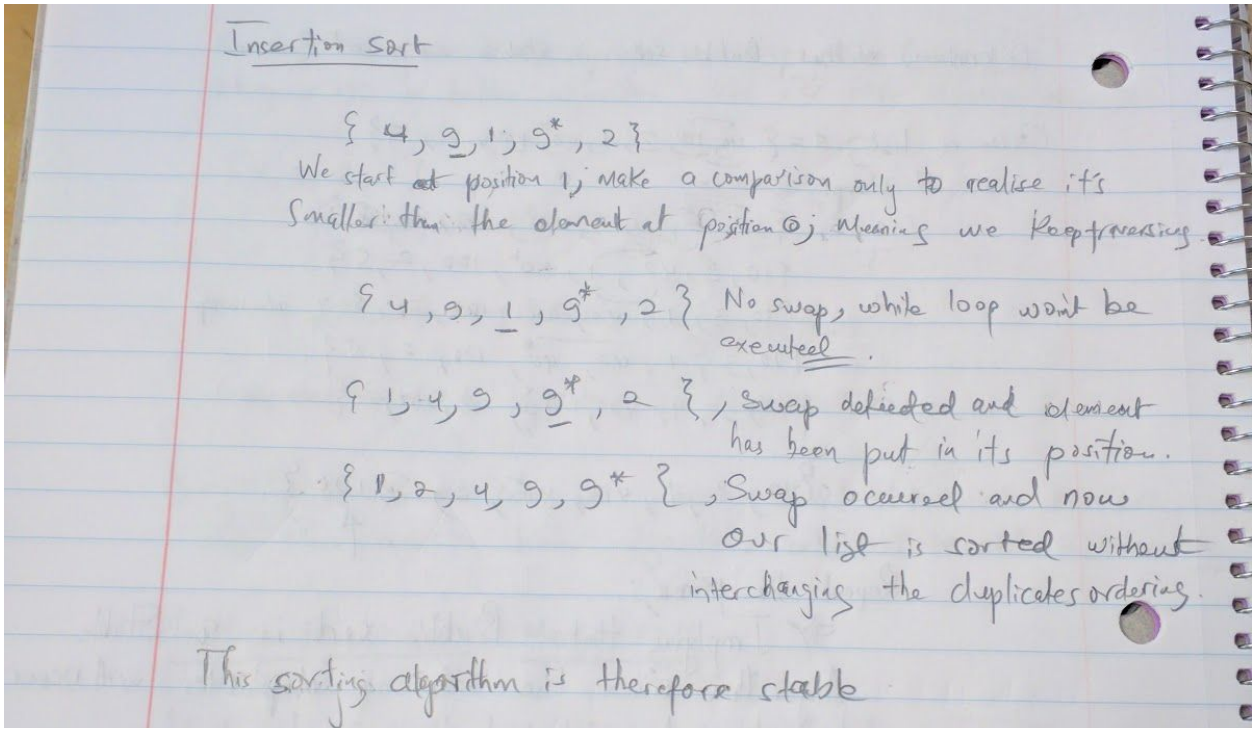
Swaps $\{1, 20, 4, 10, 2, 20^*, 12\}$

$\{1, 2, 4, 10, 20, 20^*, 12\}$ No swap.

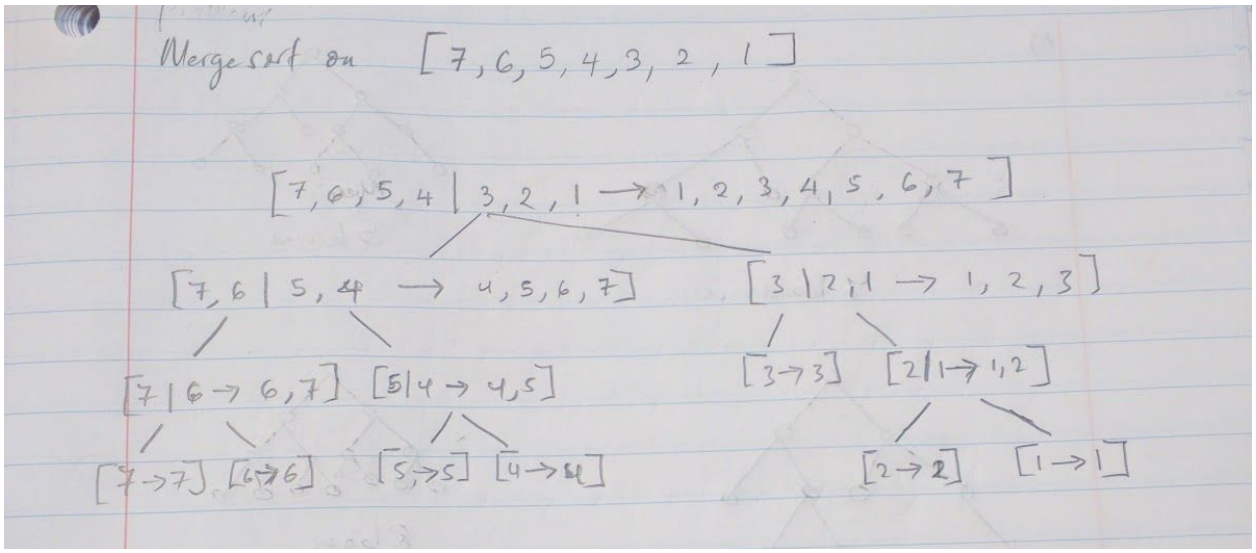
$\{1, 2, 4, 10, 20, 20^*, 12\}$

$\{1, 2, 4, 10, 12, 20^*, 20\}$ loop will break after one more check

This implies that selection sort is not a stable algorithm

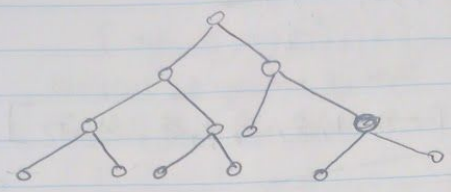


Problem2

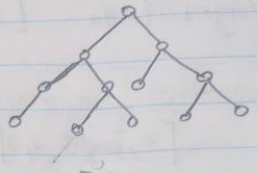


Problem4

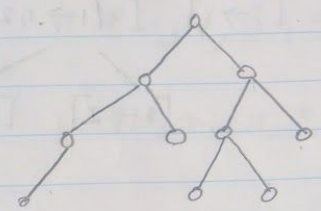
a)



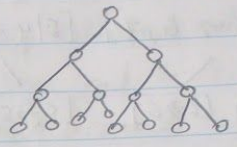
7 leaves



5 leaves



5 leaves



8 leaves

b) The deduction that every binary tree can hold at most 8 leaves is true. ($2^3 = 8$). Basing on the above results;

c) The height of a tree, n and the number of leaves
The maximum number of leaves is 2^n.

Therefore the condition

Number of leaves $\leq 2^n$.