

Algo Assignment 5 k200353 Mohsin Ali Mirza

Q1

- a) P problems:- Problems that are solvable in polynomial time
NP problems:- Problems that can be solved by nondeterministic machine in polynomial time.

P=NP means whether an NP problem can belong to class P problem. In other words, whether every problem whose solution can ~~not~~ be verified by a computer in polynomial time and can be solved by a computer in polynomial time.

b) If a problem is NP-complete, there is very likely no polynomial-time algorithm to find an optimal solution. The idea of approximation algorithms is to develop polynomial-time algorithms to find a near optimal solution.

c) NP:- NP problems ~~are~~ have solutions hard to find but easy to verify and are solvable by Non-Deterministic Turing Machine.

~~NP~~ NP-Hard Problem: Any decision problem P_i is called NP-Hard if and only if every problem of NP is reducible to P_i in polynomial time.

NP-complete:- Any problem is NP-complete if it is part of both NP and NP Hard Problem.

~~A~~ NP-Hard is validated in $T(n) = 2^n$ Time.

Q211

Assume minimum vertex is u^*

A vertex cover produced by Approx-vertex cover(g) is U

The edges chosen in Approx-vertex-cover(A) is A

A vertex in u^* -can only cover 1 edge in A .

$$\text{so } |u^*| \geq |A|$$

For each edge in A , there are ~~2 edges~~ ^{2 vertices} in U .

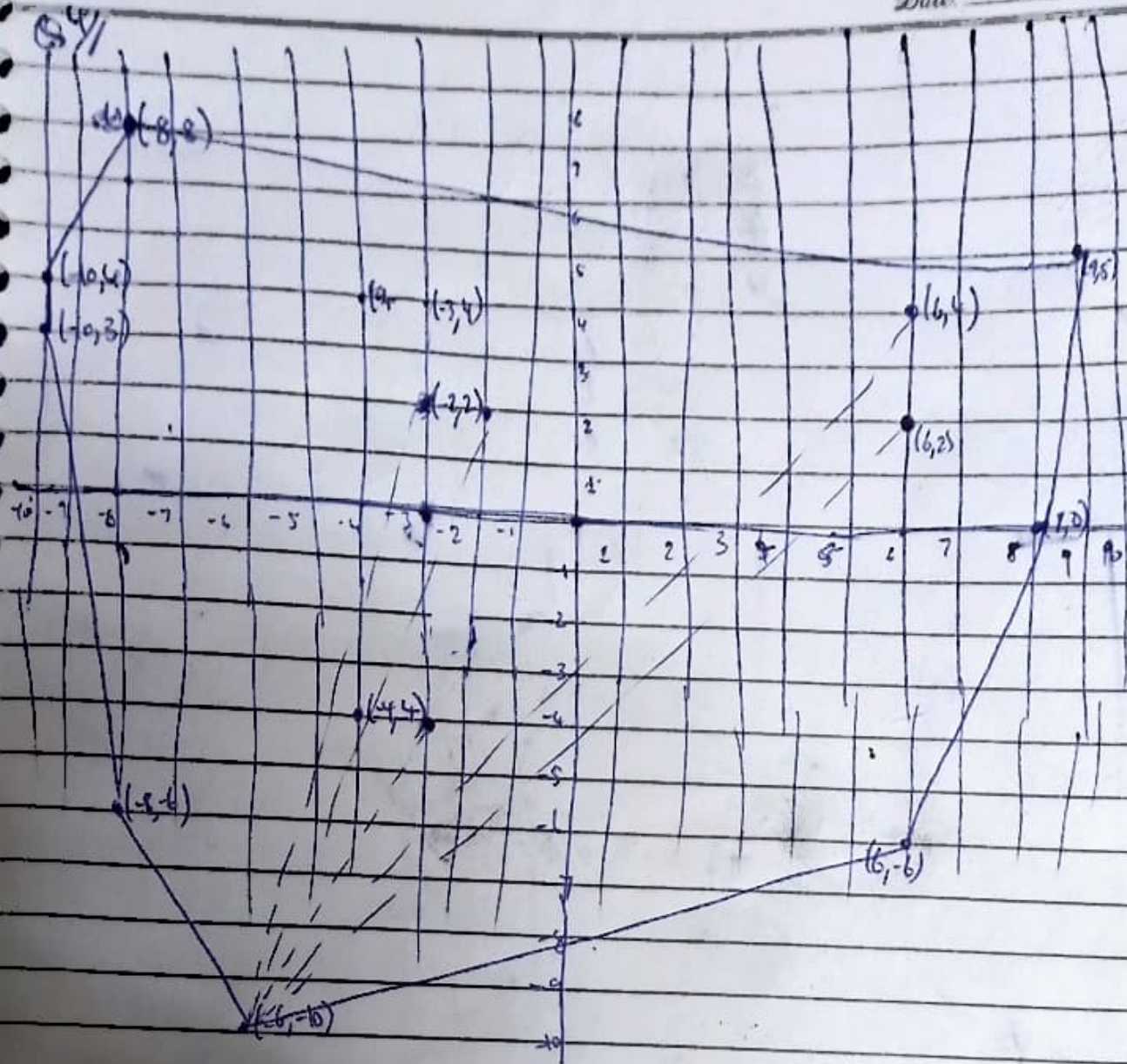
$$\text{so } |U| = 2|A|$$

$$|u^*| \geq |U|/2$$

$$|U| \leq 2$$

$$|u^*|$$

Q3 Since all the words have no repeated letters, the first word selected will be the one that appear earliest on among those with ~~the~~ most letters, this is "thread". Now, we look among the words that are left, seeing how many letters that aren't already covered that they contain. Since "rest" has 4 letters that have not been mentioned yet, and it is first among those that do, that is the next one we select. The next one we pick is "drain" because it has 2 unmentioned letters. The only one left is "shun" having unmentioned letters, so we pick that, completing our set. So, the final set of words in our cover is {thread, rest, drain, shun}



Jarvis March:- The points covered in hull of convex form are $(-6, -10) \rightarrow (6, -6) \rightarrow (8, 0) \rightarrow (9, 5) \rightarrow (-8, 8) \rightarrow (-10, 4) \rightarrow (-10, 3) \rightarrow (-8, -6)$

b' Graham Scan:- The points are same as Jarvis March but deleted points are:- $(6, 2) \rightarrow (6, 4) \rightarrow (-2, 2) \rightarrow (-4, 4), (-3, 4)$

The sorted points are:- $(-6, -10) \rightarrow (6, -6) \rightarrow (8, 0) \rightarrow (9, 5) \rightarrow (6, 2) \rightarrow (6, 4) \rightarrow (-2, 2) \rightarrow (-4, 4) \rightarrow (-3, 4) \rightarrow (-8, 8) \rightarrow (-10, 4) \rightarrow (-10, 3) \rightarrow (-8, -6)$.