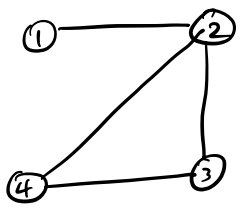
Tutorial April 1

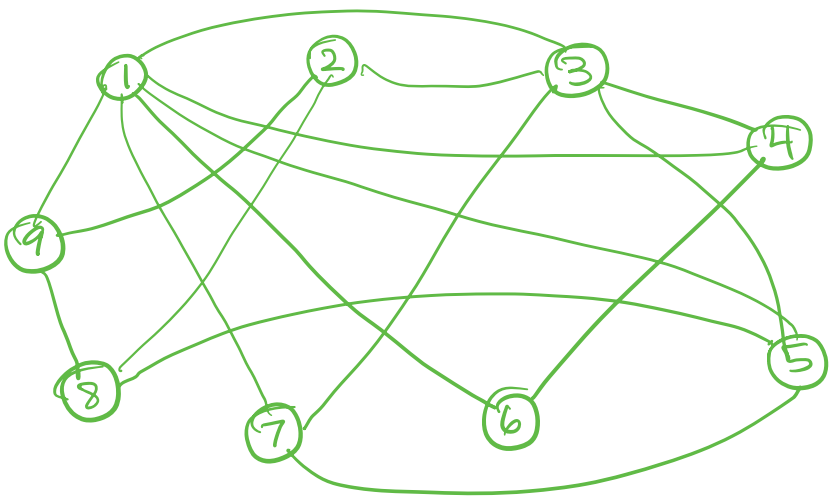
1. $HamPath = \{\langle G \rangle \mid G$ is an undirected graph, and G has a hamilton path $\}$

hamilton path = a path that visits every vertex exactly once.

Eg:



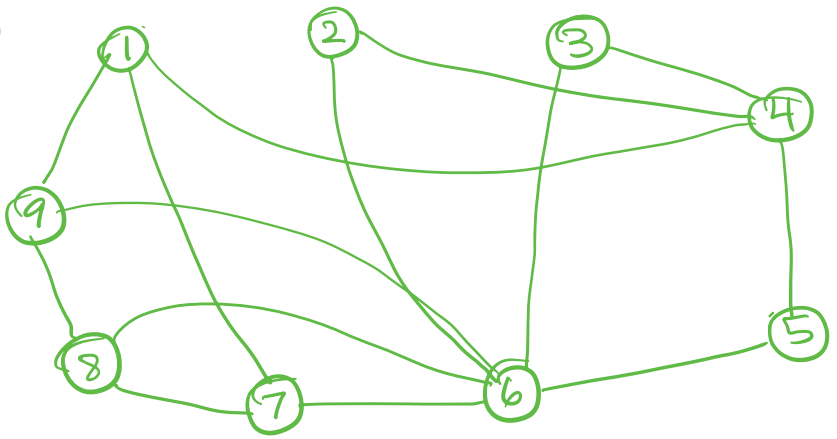
1, 2, 3, 4 is a ham'n path.



G_1

a) Prove that G_1 has a ham'n path.
What fast, non-det algorithm can recognize Ham Path?

b)



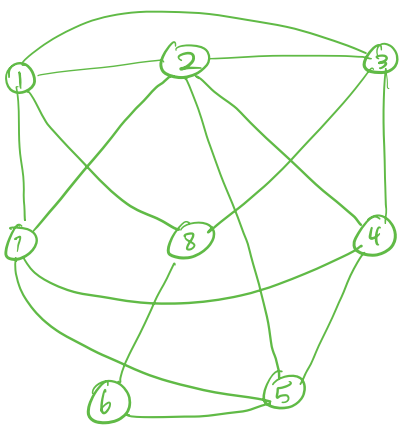
G_2

Prove that G_2 has no ham'n path.

Can you propose a fast non-det algorithm for recognizing NotHamPath $= \{ \langle G \rangle \mid G$ is an undirected graph and G has no ham'n path $\}$

2. Clique $= \{ \langle G, k \rangle \mid G$ is an undirected graph and G contains a clique of size $k \}$.

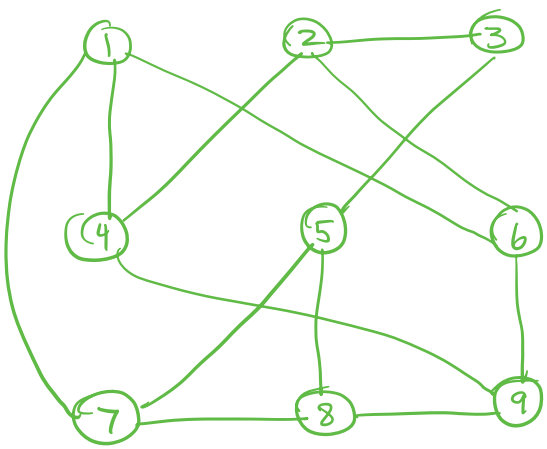
Defn: A clique of size k is a set of k vertices that are all pairwise adjacent.



G_3

$\langle G_3, 4 \rangle \in$ Clique?

4. $Path = \{ \langle G, s, t, k \rangle \mid G$ is an undirected graph, $s, t \in V(G)$, and $\exists$ an s-t path of length $\leq k \}$



$\langle G_4, 1, 5, 2 \rangle \in Path$?

5. Is $Path \in NP$? Prove your answer.
6. Is $Path \in P$? Prove your answer.
7. Is $Hampath \in NP$? Prove your answer.
8. Is $Hampath \in P$?
9. Is $Clique \in NP$? Prove your answer.
10. Is $Clique \in P$?
11. Is $NonHampath \in NP$?