NP-completeness

Wednesday, November 13, 2019 11:52 AM

Today

L is NP-complete : ① $L \in NP$

② $\forall L' \in NP, \quad L' \xrightarrow[P]{} L.$

Th. SAT is NP-complete.

L is NP-complete : ① $L \in NP$

② $SAT \xrightarrow[P]{} L.$

"If you can solve L you can solve SAT and hence all of NP".

Th. 3-SAT is NP-complete.

Pf.

$(x_1 \vee x_2 \vee x_3 \vee x_4)$

$\equiv (x_1 \vee x_2 \vee y) \wedge (\bar{y} \vee x_3 \vee x_4)$

Th. CLIQUE is NP-complete. (last week)

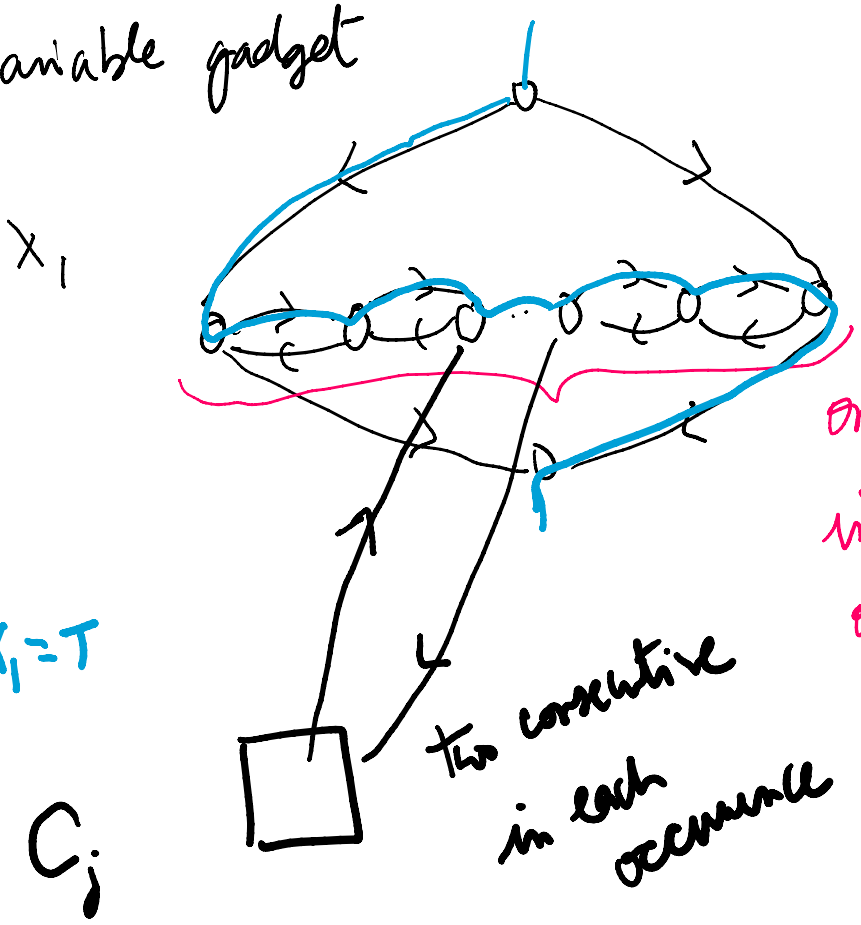
Vertex cover is _____.

I.S. ——————.

Thm Dir. Ham. Cycle is NP-complete.

Pf: SAT $\xrightarrow[P]{}$ Dir. Ham.

variable gadget

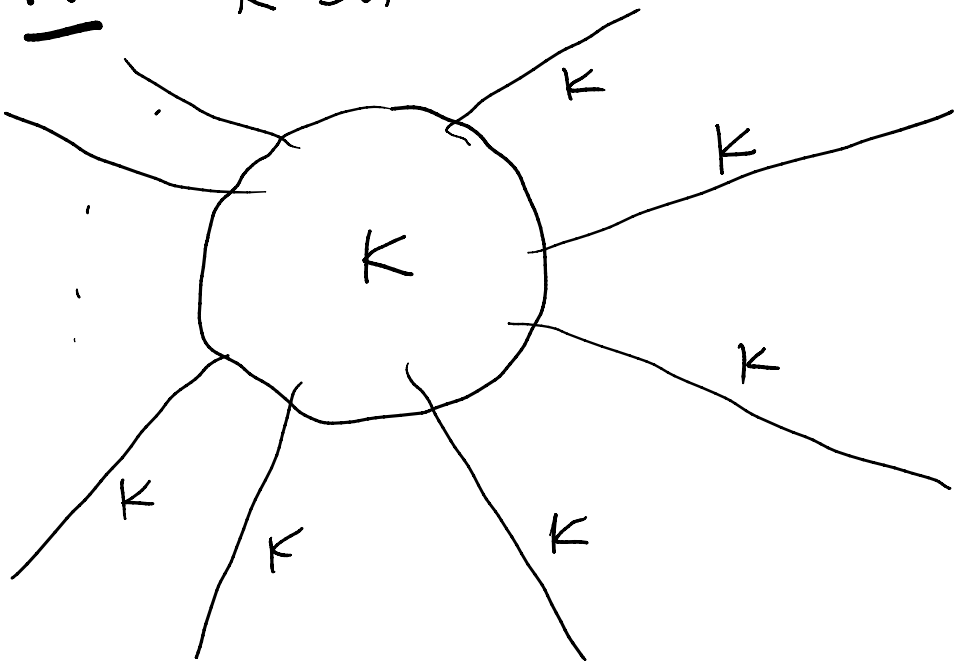


(v_j, v_{j+1}) if X_i

(v_{j+1}, v_j) if $\bar{X}_i$.

Th. V.C. $\hookrightarrow$ Dir. Ham. Cycle

Th. K-SUN is NP-complete.

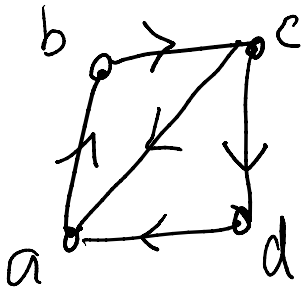


Th. Dir Ham $\xrightarrow{P}$ Ham

Pf: $v \in V \longrightarrow \{v_i, \hat{v}, v_o\} \subseteq \hat{V}$

$(v_i, \hat{v}), (\hat{v}, v_o) \in \hat{E}$

$(u, v) \in E \longrightarrow (u_i, v_o) \in \hat{E}$


b
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a
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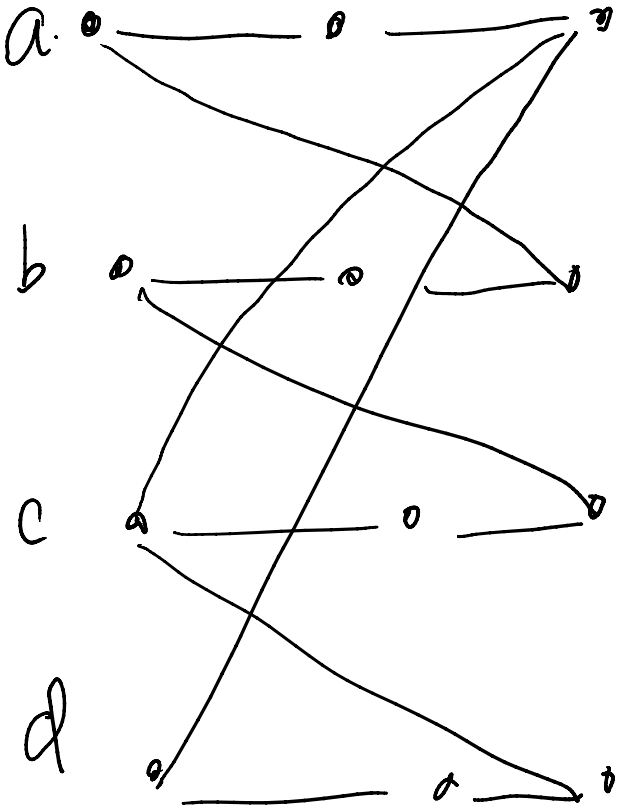
a
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