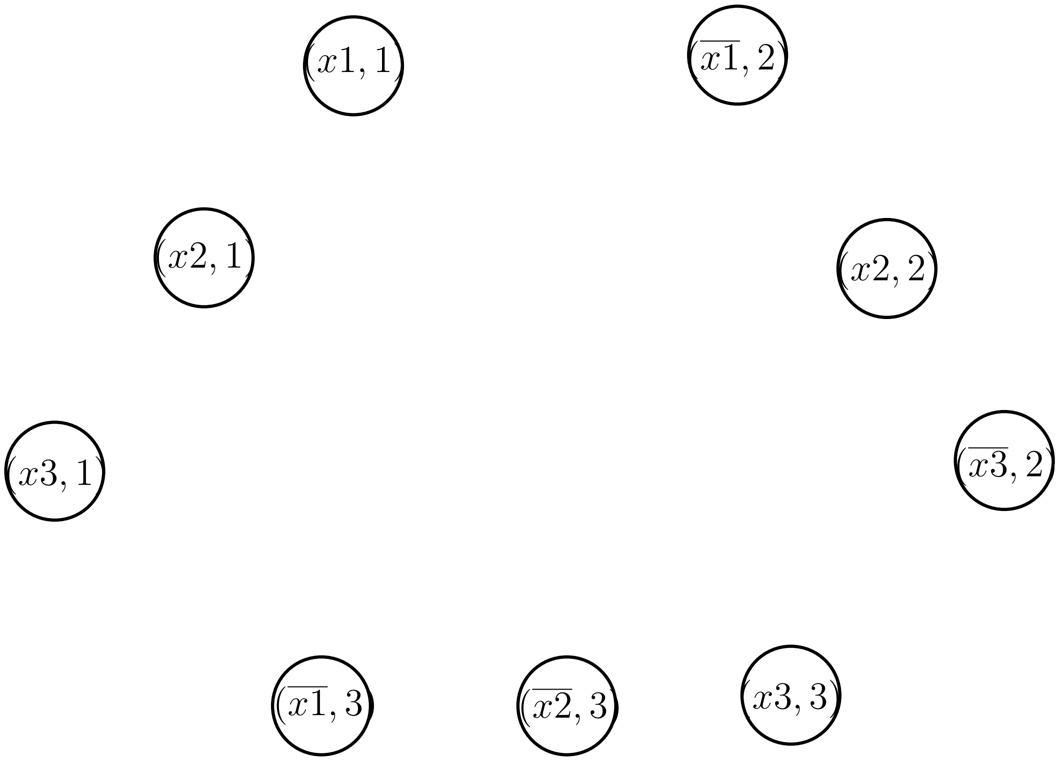
$$P := (x1 \vee x2 \vee x3) \wedge (\overline{x1} \vee x2 \vee \overline{x3}) \wedge (\overline{x1} \vee \overline{x2} \vee x3)$$



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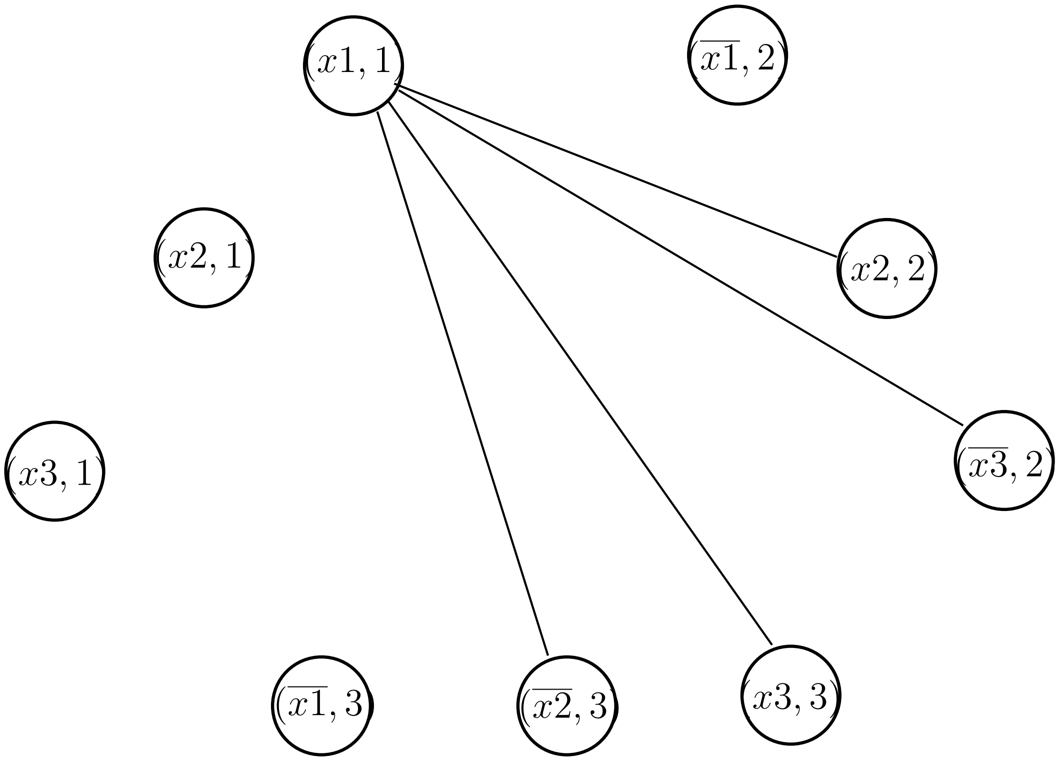

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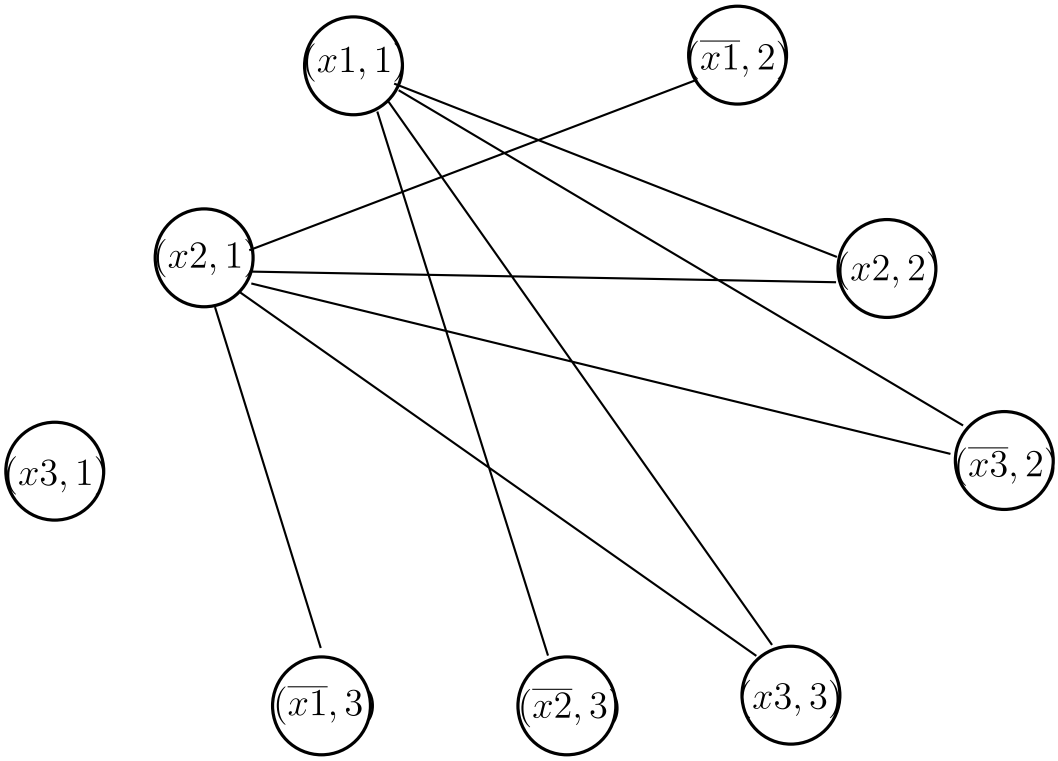

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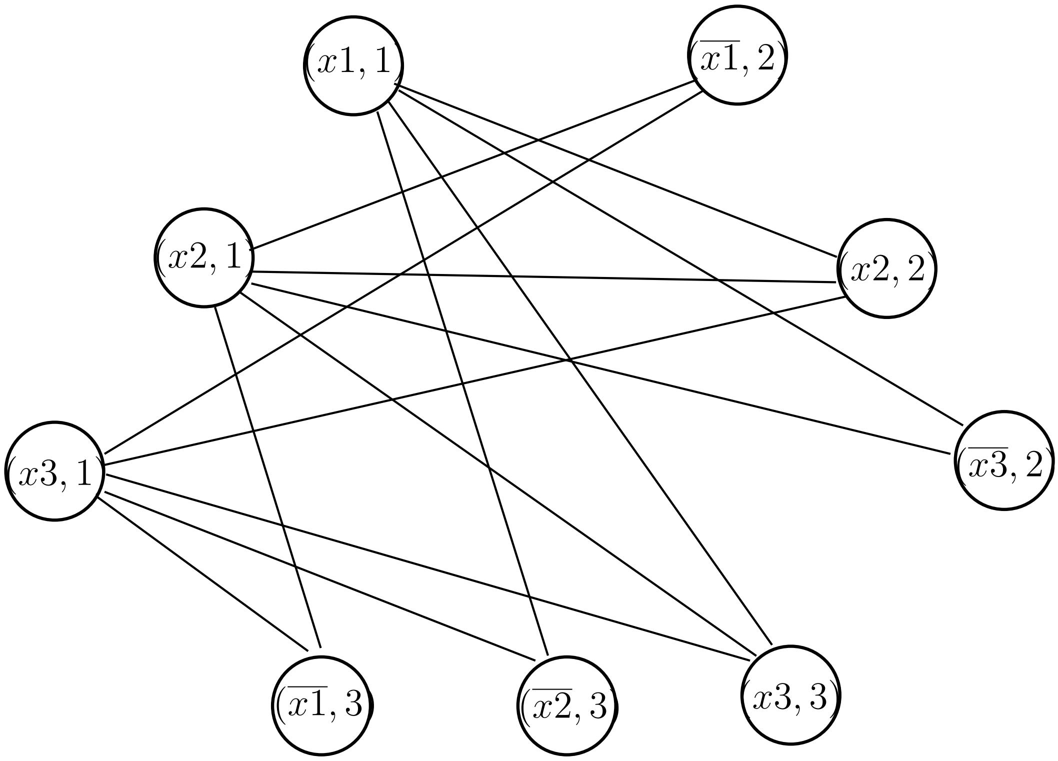

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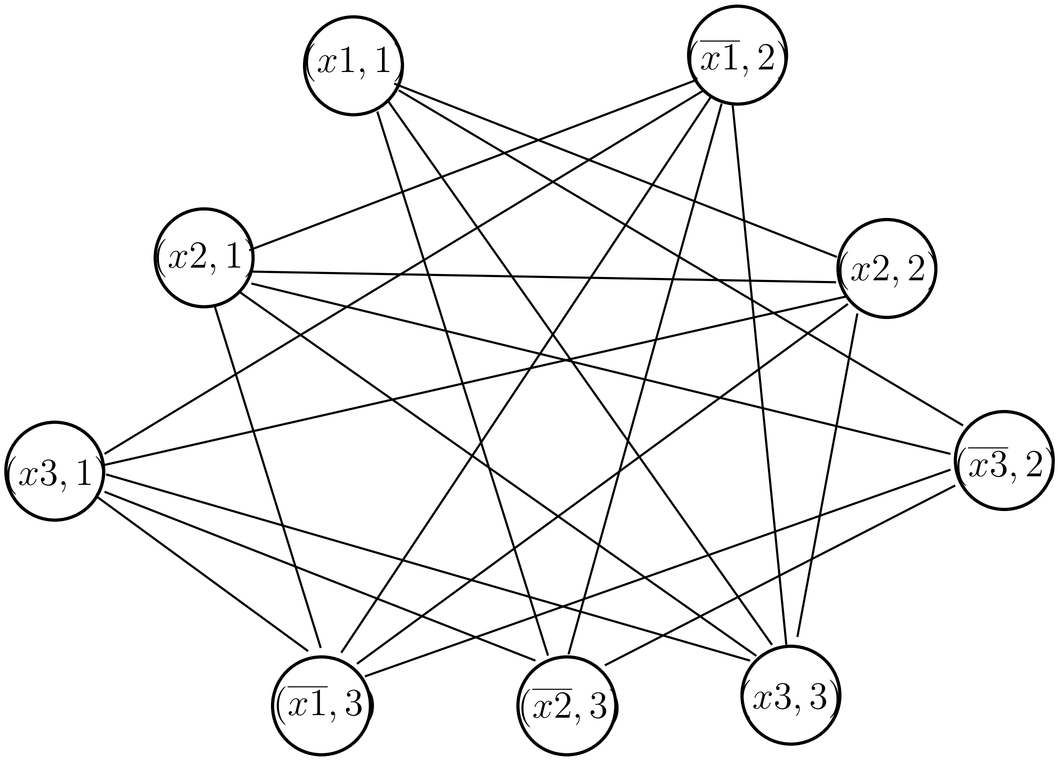
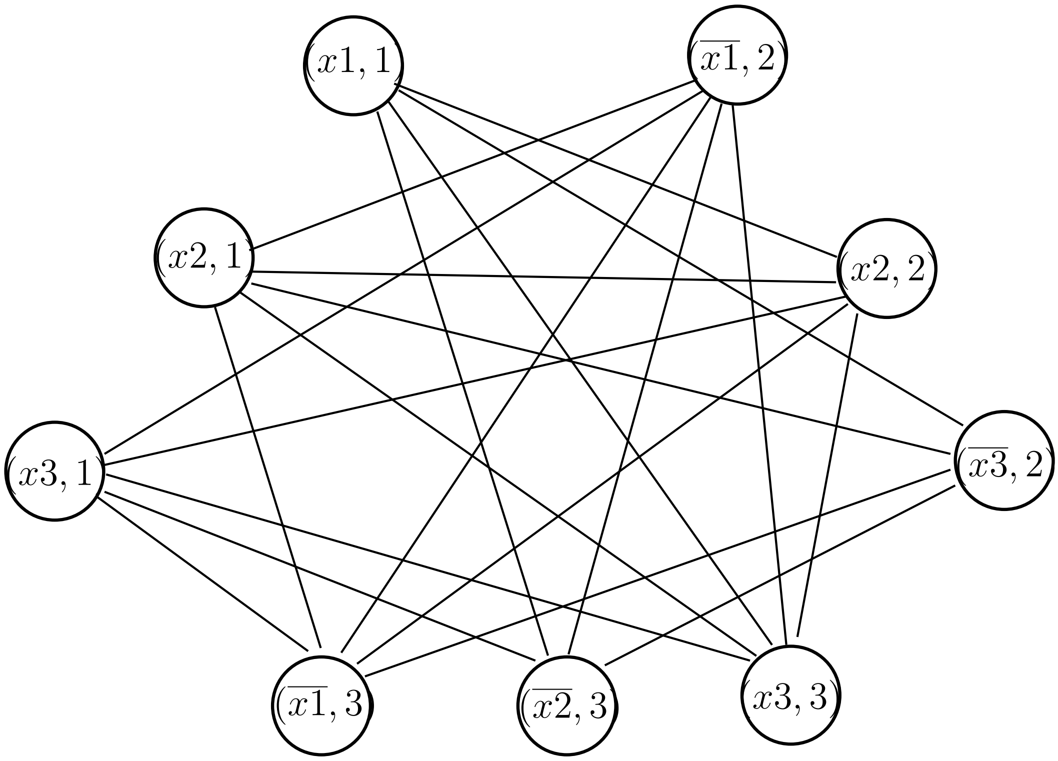


$$P := (x1 \vee x2 \vee x3) \wedge (\overline{x1} \vee x2 \vee \overline{x3}) \wedge (\overline{x1} \vee \overline{x2} \vee x3)$$

If $(x1, x2, x3) = (F, T, T)$ then P becomes T, so P is satisfiable!!



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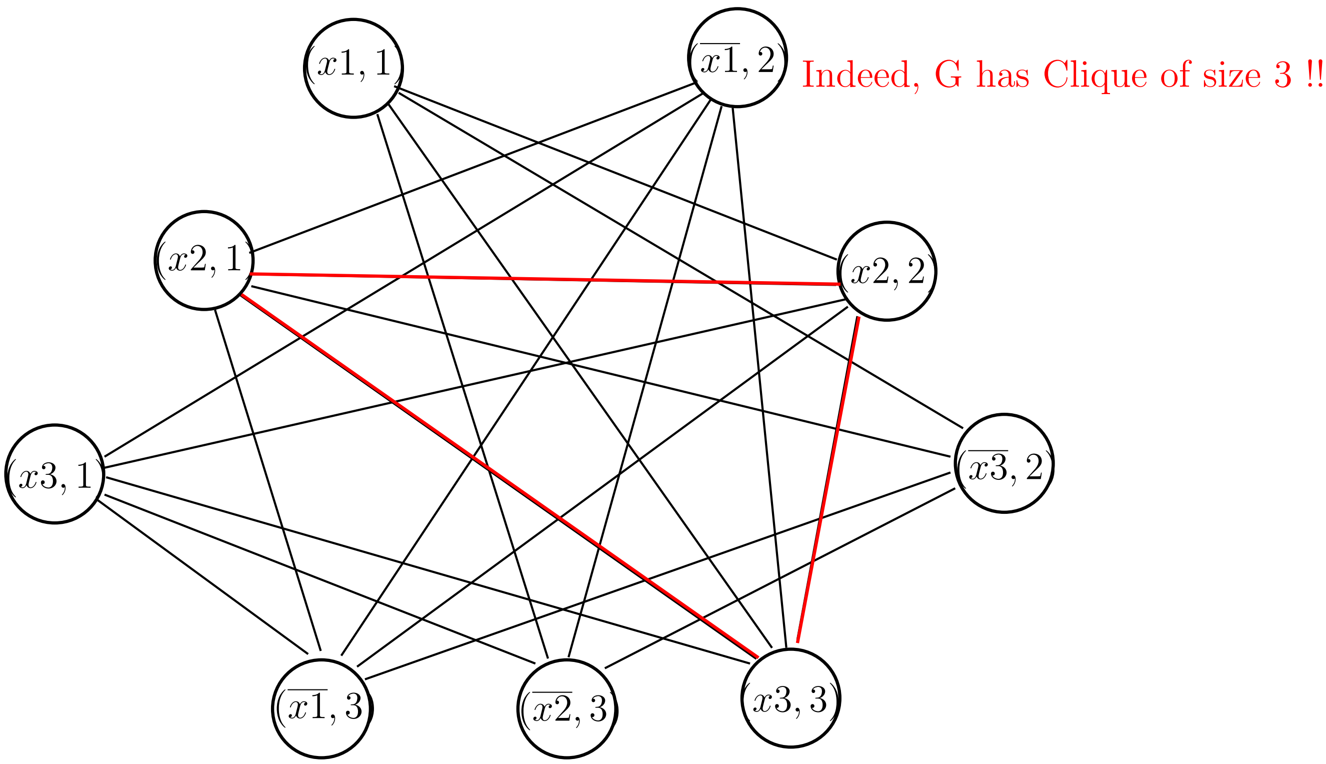

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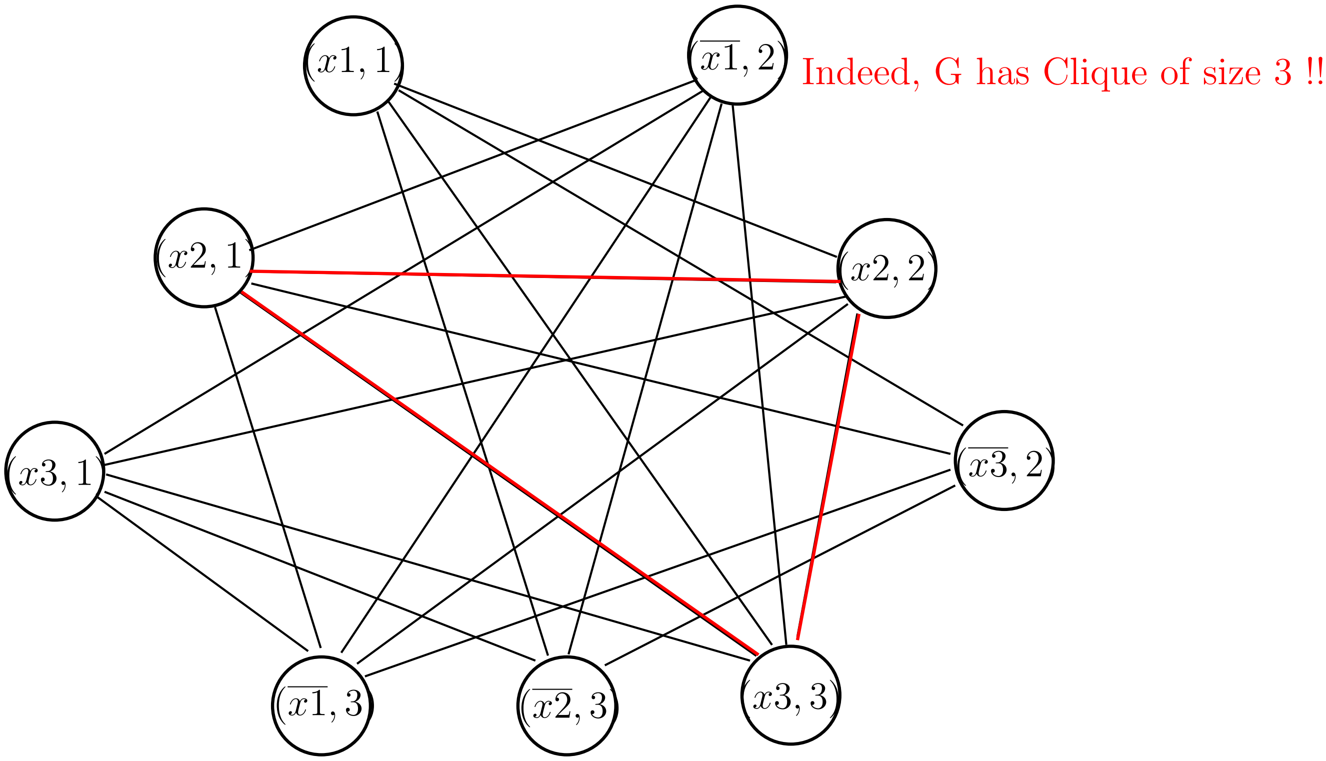
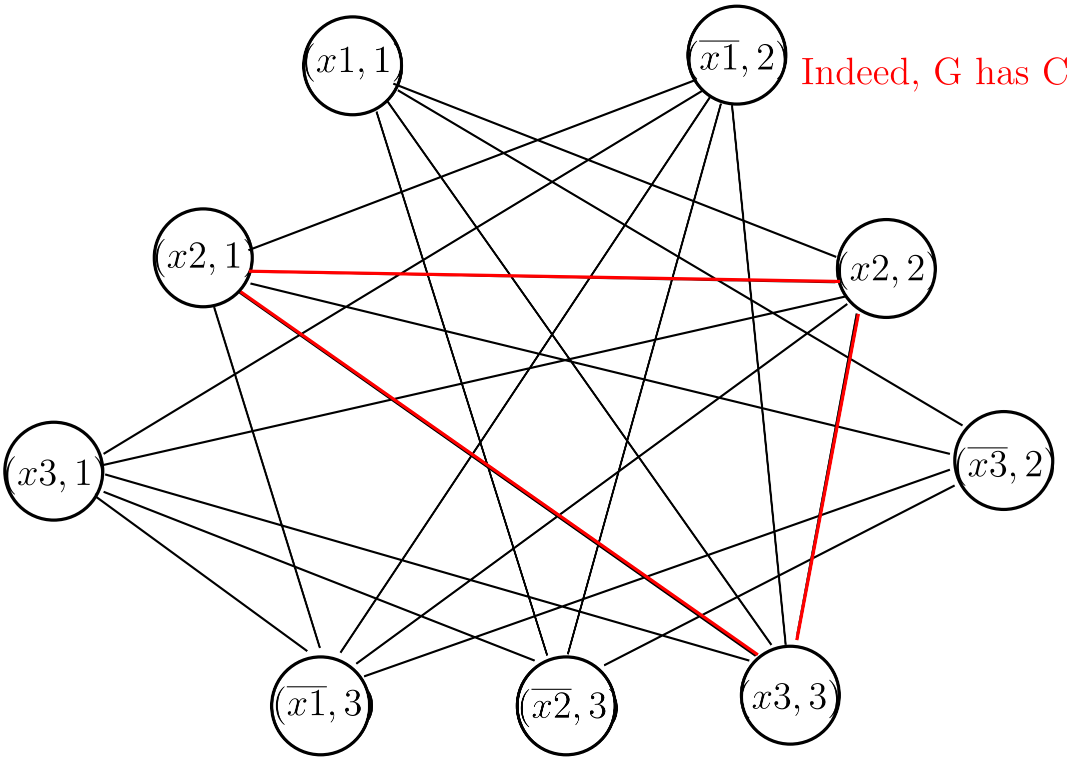


("Yes" $\Rightarrow$ "Yes")

- Let P be satisfiable. Then every clause has at least one T, say y_1, y_2, y_3.
- Note that $y_1 = y_2 = y_3 = TRUE$ at the same time, so $y_i \neq \overline{y_j}$.
- Since $y_i \neq \overline{y_j}$ and y_1, y_2, y_3 are all in distinct clauses, by the construction of G, every vertex (y_i, i) has an edge to (y_j, j) in G. So G has clique $\{(y_1, 1), (y_2, 2), (y_3, 3)\}$ of size 3.

$P := (x1 \vee x2 \vee x3) \wedge (\overline{x1} \vee x2 \vee \overline{x3}) \wedge (\overline{x1} \vee \overline{x2} \vee x3)$

If $(x1, x2, x3) = (F, T, T)$ then P becomes T, so P is satisfiable!!



Indeed, G has Clique of size 3 !!

("Yes" $\Leftarrow$ "Yes")

- Let G has clique $C \subseteq G$ of size ≥ 3. Then
- Each vertex (y,i) of C must have different value i (i.e., from different clause).
- Also, no vertex in C is negation of the other vertex in C.
- Set every vertex in C as TRUE. Then every clause in P has at least one True, which is from the corresponding vertex in C. So P becomes true and satisfiable.