Independent Set

Given graph $G = (V, E)$ & number k, find a subset $U \subseteq V$, $|U| \geq k$, such that there is no edge between vertices in U.

Theorem: Independent Set problem is NP-complete

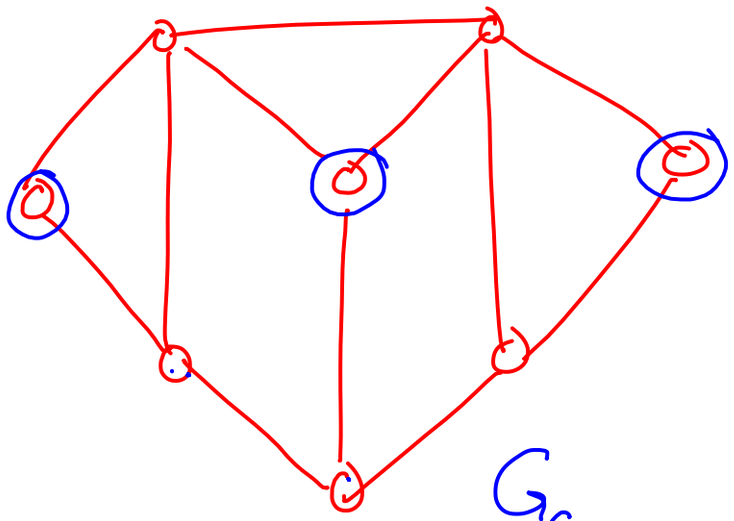
proof: By reduction from a special type of Satisfiability problem called 3SAT.

↓

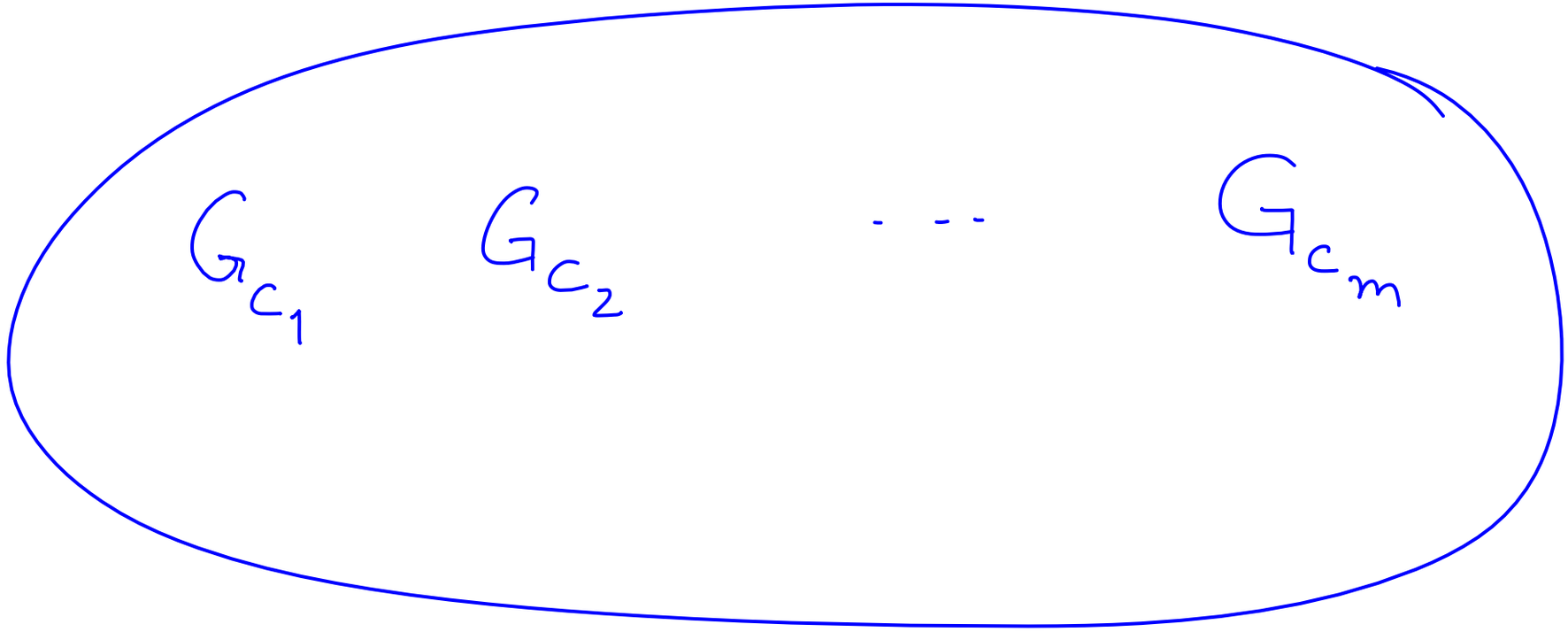
clauses in formula have at most 3 variables.

Given formula $F = C_1 \wedge C_2 \wedge \cdots \wedge C_m$ over n variables $x_1, x_2, \ldots, x_n$.

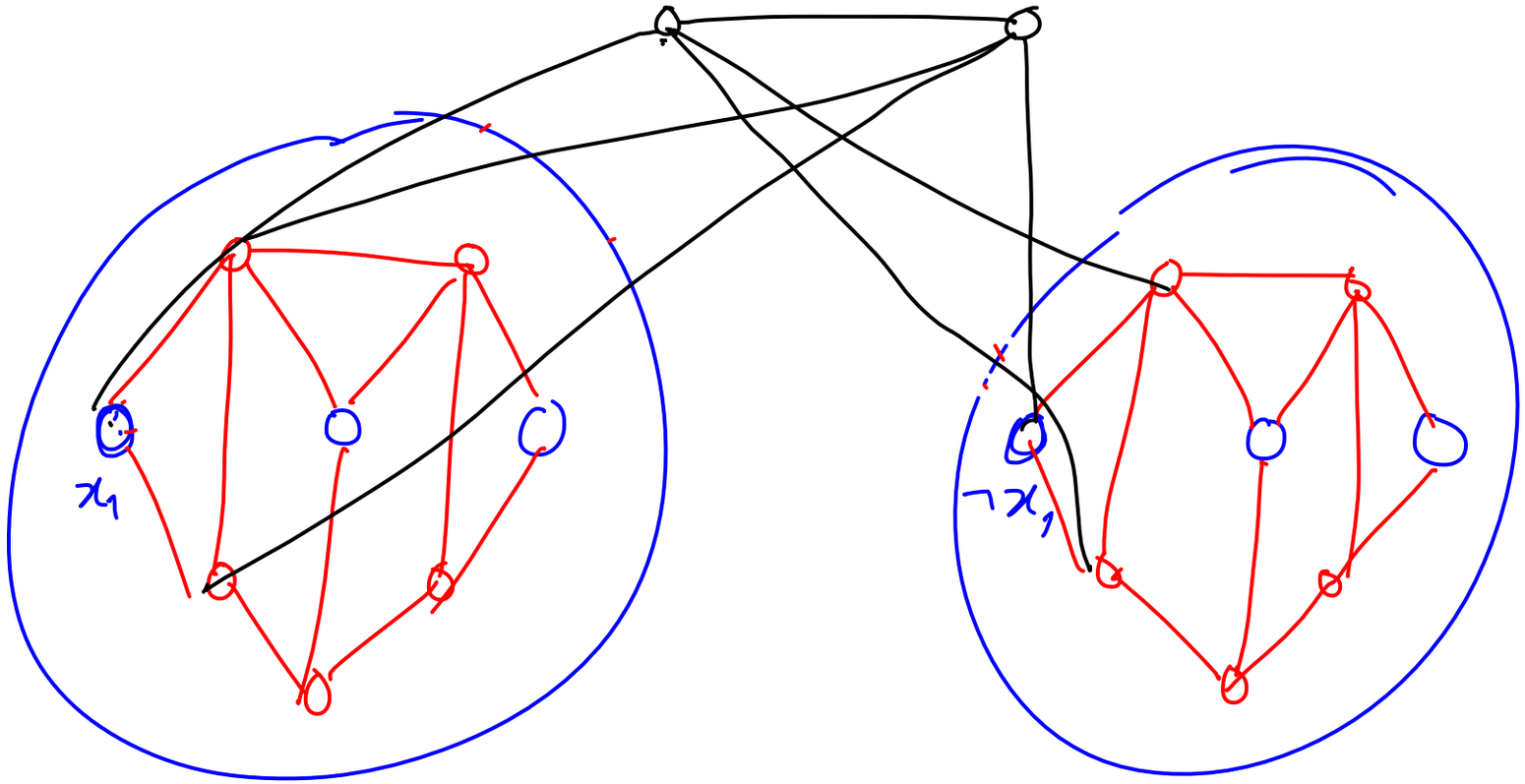
For each clause, use the following graph:



G_C



$\bar{F} = C_1 \wedge C_2 \wedge \cdots \wedge C_m$ with no variables common between clauses.



G_{c_i} G_{c_j}

Variable x_1 occurs +vely in clause c_i, −vely in clause c_j