

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 .

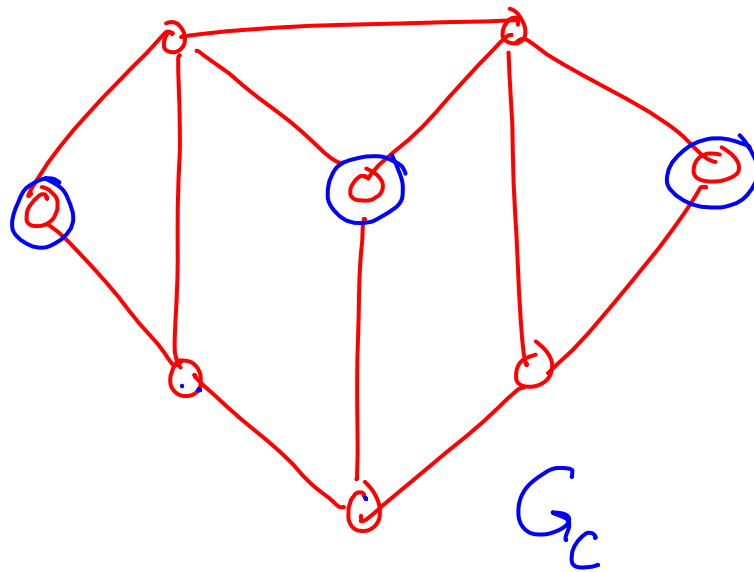
Theorem : Independent Set problem is NP-complete

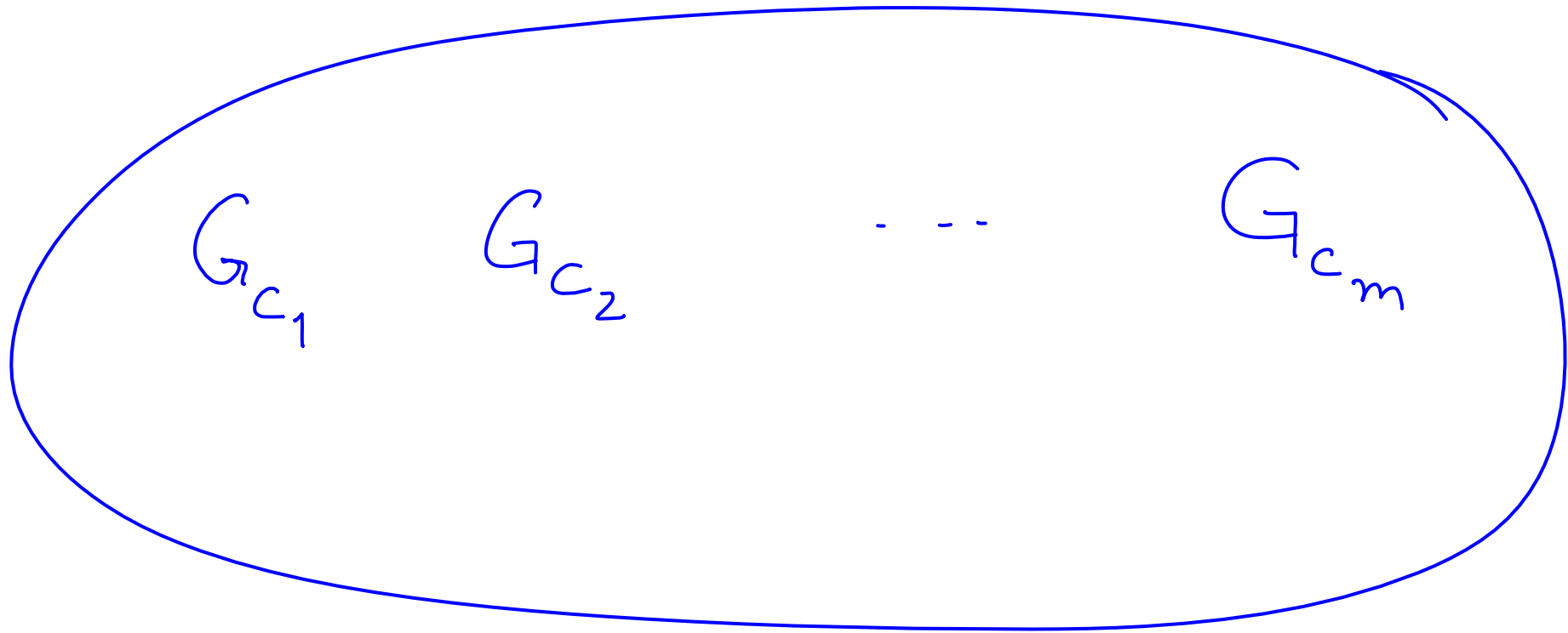
proof: By reduction from a special type of Satisfiability problem called 3SAT.

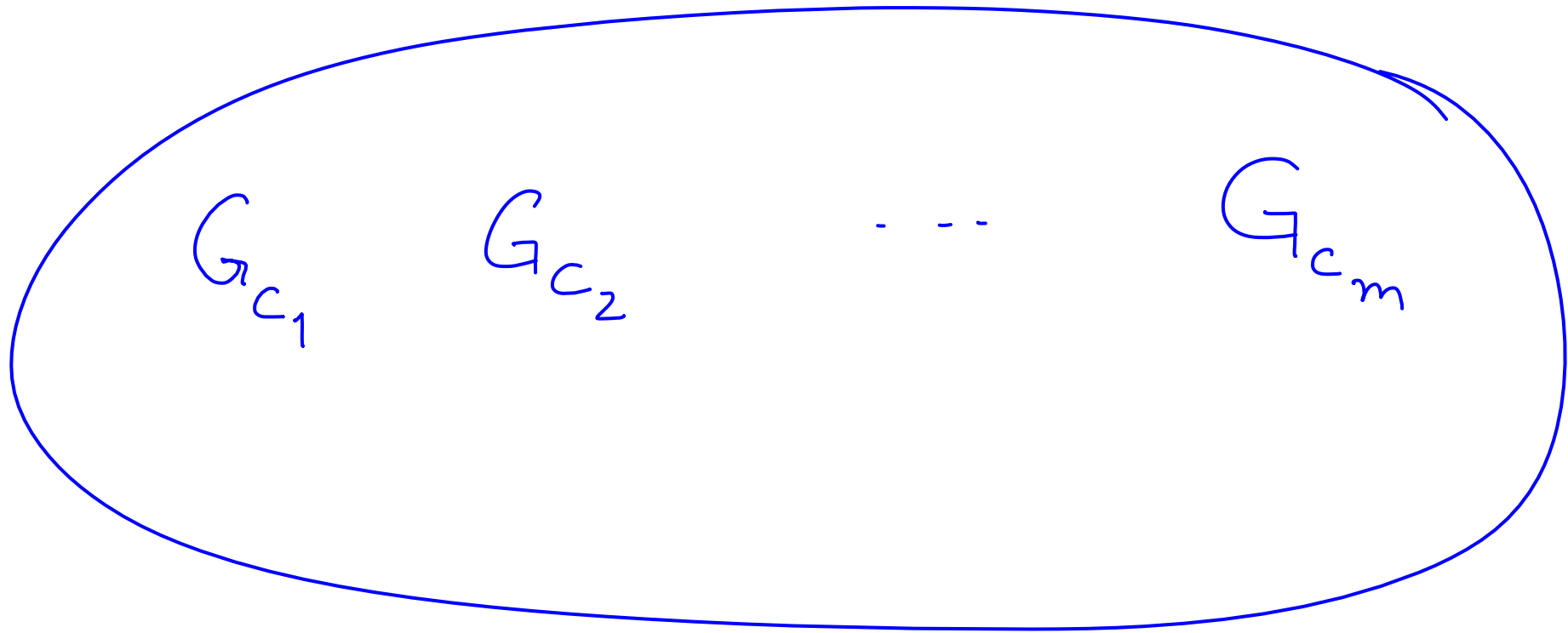
↓
clauses in formula
have at most 3
variables.

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

For each clause, use the following graph:

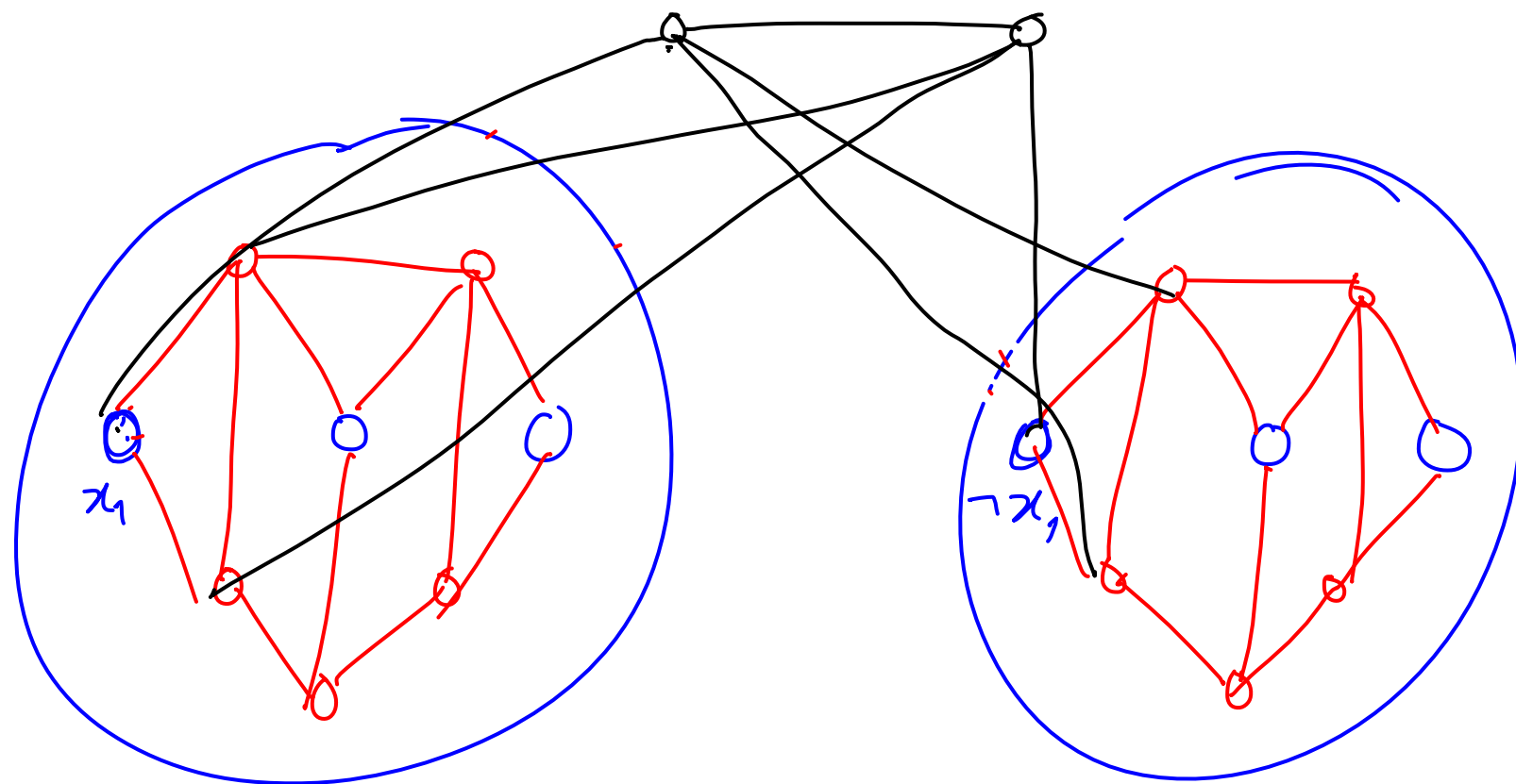






A hand-drawn diagram showing a blue oval containing the terms G_{C_1} , G_{C_2} , an ellipsis (\dots), and G_{C_m} from left to right. Below the oval, a blue arrow points from the oval to the equation $\bar{F} = C_1 \wedge C_2 \wedge \dots \wedge C_m$. To the right of the equation, the text "with no variables common between clauses." is written in blue ink.

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



G_{C_i}
 G_{C_j}
 Variable x_1 occurs +vely in clause C_i , -vely in clause C_j