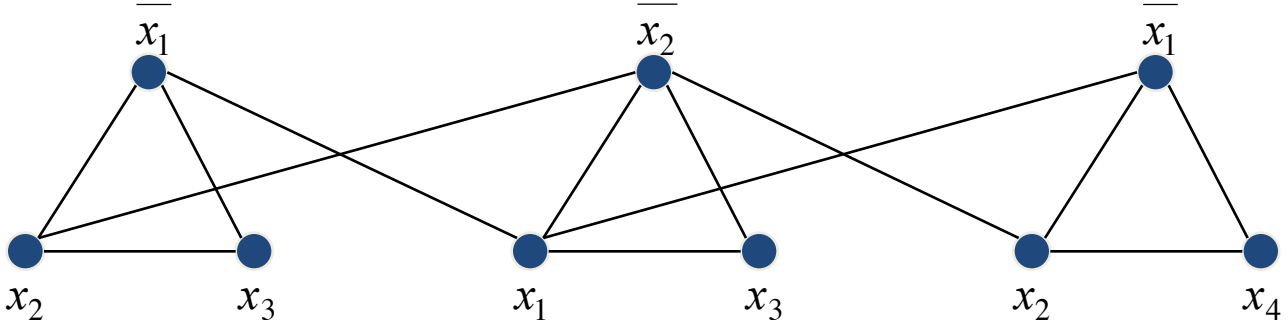
3-Satisfiability Reduces to Independent Set

- **Claim**. 3-SAT $\leq_P$ INDEPENDENT-SET.
- **Pf**. Given an instance Φ of 3-SAT (I_1), we construct an instance (G, k) of INDEPENDENT-SET (I_2) that has an independent set of size k iff Φ is satisfiable.

- **Construction** (Step 3a)
  - G contains 3 vertices for each clause, one for each literal.
  - Connect 3 literals in a clause in a triangle.
  - Connect literal to each of its negations.
  - *The size of I_2 is polynomial in the size of I_1*

G



k = 3

$$\Phi = \left(\overline{x_1} \vee x_2 \vee x_3 \right) \wedge \left(x_1 \vee \overline{x_2} \vee x_3 \right) \wedge \left(\overline{x_1} \vee x_2 \vee x_4 \right)$$