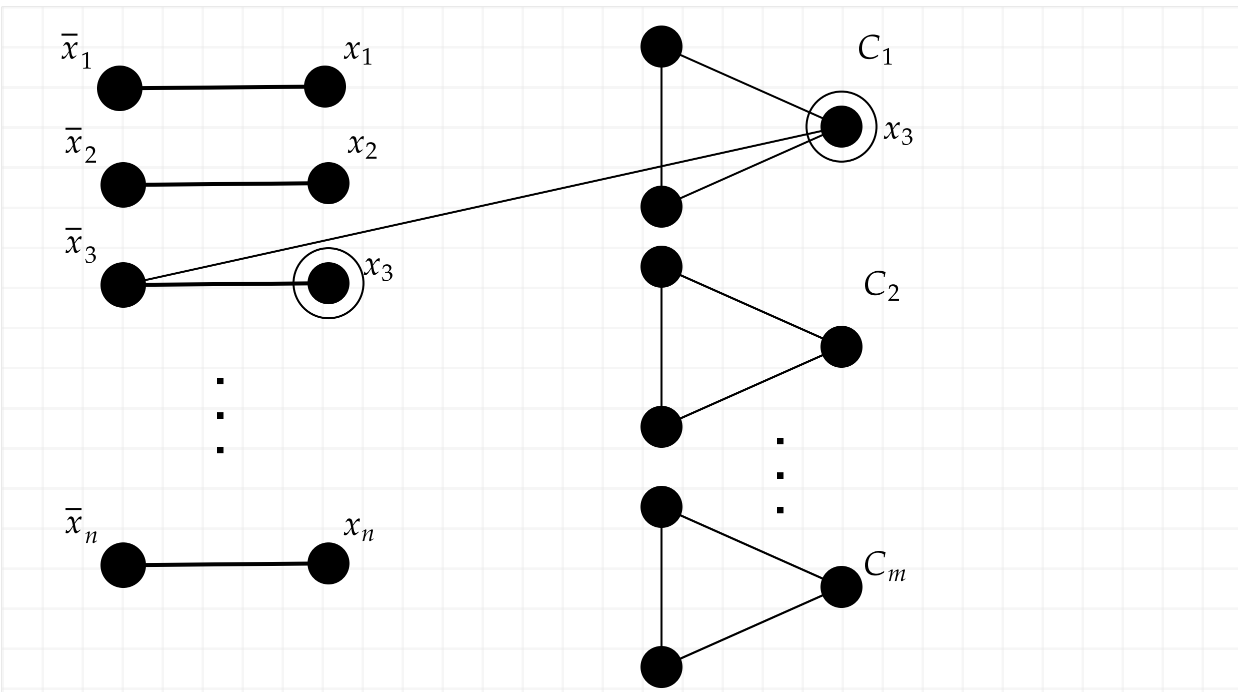
CSE491/596 Lecture Fri. 10/29/20: Reductions From 3SAT By Component Design I

[The lecture went over Homework 5, including presentation options, and then made further observations on the Cook-levin Theorem (the "Scholia"). This was covered at the end.]

The "Ladder and Gadgets" framework for reductionf from 3SAT: Given a 3CNF formula $\phi(x_1, \dots, x_n) = C_1 \wedge \cdots \wedge C_m$, lay out n "rungs" of 2 nodes each and m "clause gadgets", plus (optionally) space for one or more "governing nodes":



Usually the rung nodes are connected, but not always---and sometimes an extra node or two are added to each rung.To show 3SAT $\leq_m^p$ IND SET, we need to map $f(\phi) = (G, k)$ such that G has an ind. set of size (at least) k if and only if ϕ is satisfiable. Take k to be the max possible, which is: $n + m$.

$\phi = (x_1 \vee \bar{x}_2 \vee x_3) \wedge (x_1 \vee x_2 \vee \bar{x}_3) \wedge (\bar{x}_1 \vee \bar{x}_3 \vee \bar{x}_4)$.