

Reducing 3-SAT to CLIQUE

Complexity Theory:

3-SAT is a classic NP-complete problem. It reduces to the CLIQUE problem, which is also NP-complete. This reduction is one of the easier ones to follow and gives a sense for the fun involved in these kinds of problems in the field of **complexity theory**.

In advanced theoretical computer science, there are many interesting complexity theory problems like these requiring ingenuity and problem solving for recognizing and transforming seemingly unrelated problems using clever reductions. The goal in studying complexity theory is to understand relationships among problems, quantify the difficulty in solving them, and explore the bounds of computability.

Reducing 3-SAT to CLIQUE:

Please read more about these two NP problems on Wikipedia: https://en.wikipedia.org/wiki/Boolean_satisfiability_problem

In particular, know how the reduction works (**this would be a good final exam question**): https://upload.wikimedia.org/wikipedia/commons/a/a5/Sat_reduced_to_Clique_from_Sipser.svg

For those that like videos, here's a nice set for Theoretical Computer Science (see videos #169-173 for 3-SAT to CLIQUE): <https://www.youtube.com/playlist?list=PLAwTw4SYaPI4bx7Pck4JWjy1WVbrDx0U>

Related fun:

Another interesting NP problem besides CLIQUE is the INDEPENDENT SET problem... in case you are hooked on these! Go have fun...

One of my favorite complexity classes, which is a different class from NP, is the BPP class (bounded-error probabilistic polynomial time), in case NP is not enough fun for you.