COLORING: Given $G, k$, is $G$ $k$-colorable?

COLORING in NP: evidence is the coloring

verify uses $k$ colors
verify endpoints of each edge diff color

Poly time

COLORING is NP-complete

3-CNF-SAT ≤P COLORING:

We need to construct $G$, pick $k$ given 3-CNF $\varphi$

$s.t., \varphi$ is satisfiable $\iff G$ is $k$-colorable

(and construction must work in poly time)
\((\bar{x} \lor \gamma \lor \bar{z}) \land \bar{x} \lor \gamma \lor \bar{z}\)