$\mathcal{NP}$-hard

A problem π is said to be $\mathcal{NP}$-hard if a polynomial time algorithm to solve π could be used to solve *every* problem in $\mathcal{NP}$ in polynomial time.
Notes:

- If π satisfies $\forall \pi' \in \mathcal{NP}, \pi' \propto \pi$, then π is $\mathcal{NP}$-hard.
- If any $\mathcal{NP}$-hard problem can be solved in polynomial time, then so can all problems in $\mathcal{NP}$!
- Karp already proved that 3-SAT is $\mathcal{NP}$-hard (as well as 20 other problems). Many other problems have been proven to be $\mathcal{NP}$-hard.
- To prove that a new decision problem π is $\mathcal{NP}$-hard, you just have to find a known $\mathcal{NP}$-hard problem π' and show that $\pi' \propto \pi$.