$P \neq NP$  

- **$X$ in NP-hard** — at least as hard as any problem in NP
- **$X$ in NP-complete** — in NP and NP-hard

**Clique**: does a clique of size $k$ exist? $\Theta(n^2) = \Theta(n^k)$

**Vertices cover**: subset $V$ that "cover" all edges

**Hamiltonian Cycle**: cycle through every vertex

**List of edges for every vertex**

1. $\text{a, b, c, d, e}$
2. $\text{a, b, c, d, e}$

**Other notes**
$s = \{ x_1, x_2 \ldots x_n \}$

$|t| = \sum_{i=1}^{n} x_i$

NP-complete

in NP?