# #1 Membership

Show that each of the following languages are in $\mathsf{NP}$.

1. $A_1 = \{ \langle P \rangle \mid P \text{ is a satisfiable boolean formula} \}$.
2. $A_2 = \{ \langle S, t \rangle \mid S \subseteq \mathbb{Z} \text{ and there exists } x_1, \ldots, x_k \in S \text{ such that } \sum_i^k x_i = t \}$.
3. $A_3 = \{ \langle G, k \rangle \mid G = (V, E) \text{ is a graph and there exists some } V' \subseteq V \text{ is a } k\text{-covering of } G \}$.
   A k-cover of a graph is a subset of vertices that includes at least one endpoint of every edge in the graph.

# #2 Completeness

Define the following languages:

$$\begin{aligned} \mathsf{CLIQUE} &= \{ \langle G, k \rangle \mid G \text{ is a graph and } G \text{ contains a } k\text{-clique} \} \\ \mathsf{ISO} &= \{ \langle G, H \rangle \mid G \text{ and } H \text{ are graphs and there is a subset } G' \subseteq G \text{ isomorphic to } H \} \end{aligned}$$

*Call graphs $G_1$ and $G_2$ isomorphic if the vertices of $G_1$ may be relabeled so that $G_1$ and $G_2$ are identical graphs. See https://en.wikipedia.org/wiki/Graph_isomorphism for a good picture (and better definition).*

Show that $\mathsf{CLIQUE} \leq_p \mathsf{ISO}$.

(Hint: what is the type of the mapping function $f$ in this case?)