

# CS3100: Algorithms

## NP-Hardness

### In class, November 8

## Problems

1. Given a graph  $G$  and a variable  $k$ , the longest path problem asks if  $G$  contains a simple path which visits at least  $k$  vertices of  $G$ . Prove that longest path is NP-Complete.
2. Consider the following problem: Given a set of numbers  $S$ , are there subsets  $A$  and  $B$  such that  $A \cup B = S$ ,  $A \cap B = \emptyset$ , and

$$\sum_{a \in A} a = \sum_{b \in B} b$$

Show that this problem is NP-Complete.

3. A tonian path in a graph  $G$  is a path that goes through at least half of the vertices of  $G$ . Show that determining whether a graph has a tonian path is NP-complete.