1. Let $A$ be the set of all strings of the form $www$ (with binary alphabet). Show that $A$ is decidable in linear time.

2. Consider the following problem. An implication $a \rightarrow b$ means that if $a$ is TRUE then $b$ is TRUE (but imposes no restriction when $a$ is false). A literal is either a boolean variable or a negated boolean variable. You have a list of implications involving boolean literals. For example, you might have $c \rightarrow d$: this means that if $c$ is FALSE then $d$ must be TRUE. Find a polynomial-time algorithm for deciding the satisfiability of a list of implications. (This is equivalent to showing that what is called 2SAT is in $P$.)

3. Show that if $P = NP$, then there is a polynomial-time algorithm to find a maximum clique in a graph.

   (Background: A clique in a graph is a collection of vertices such that every vertex in the collection has an edge to every other vertex in the collection. The CLIQUE problem has as input a graph and a number, and the answer is whether the graph has a clique of that size or not. The CLIQUE problem is in $NP$.)

4. Is it possible that $P = NP$ is undecidable?

Due: Tuesday April 20 6pm Sharp

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