

CS 362, HW 12

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1. Saia Trucking is a safety conscious (and algorithm loving) trucking company. Given a pair of cities, they always try to find the *safest* route between that pair. They are thus faced with the following problem.

You are given a directed graph $G = (V, E)$; the vertices are cities and the edges are roads. Each edge has a number that gives the probability of driving across that edge without an accident. The probability of safe travel along any path is the *product* of the probabilities of safe travel along each edge in that path.

Your goal is to find a path from a given node s to a given node t that maximizes the probability of safe travel. Describe an efficient algorithm to solve this problem.

2. Problem 22-3 from our textbook: “Arbitrage”
3. Imagine someone gives you a polynomial time algorithm to solve 3-SAT. Describe how you could use this algorithm to efficiently find a satisfying assignment for any satisfiable 3-CNF formula.
4. In the **RADIO-TOWERS** problem, you are given (1) a set S of towers; (2) a set T of subsets of towers; and (3) a set of k radio frequencies. You must determine: Is it possible to assign exactly one of k possible radio frequencies to each tower in such a way that each tower in each set in T has a unique radio frequency?

As an example, let $S = \{a, b, c, d\}$, $T = \{\{a, b, c\}, \{a, d\}, \{a, b, d\}\}$, and $k = 3$. Then the answer is YES since we can assign tower a frequency 1, tower b frequency 2, and towers c and d frequency 3, thereby ensuring that each tower in each set in T has a unique frequency. Prove that this problem is NP-Hard by reduction from a problem we have covered in class.