1. Why does Bellman-Ford only need $|V| - 1$ iteration in its main loop?

2. How does Bellman-Ford handle negative weight cycles?

3. Arbitrage is the use of discrepancies in currency exchange rates to transform one unit of a currency into more than one unit of the same currency. For example, suppose 1 US dollar buys 49 Indian rupees, 1 Indian rupee buys 2 Japanese yen and 1 Japanese yen buys 0.0107 US dollars. Then by converting currencies, you can start with 1 US dollar and buy $49 \times 2 \times 0.0107 = 1.0486$ US dollars, or a profit of 4.86%.

Suppose you are given $n$ currencies $c_1, c_2, ..., c_n$ and an $n \times n$ table $R$ of exchange rates, such that one unit of currency $c_i$ buys $R[i,j]$ units of currency $c_j$.

Give an efficient algorithm to determine whether or not there exists a sequence of currencies $< c_{i_1}, c_{i_2}, ..., c_{i_k} >$ such that
\[ R[i_1, i_2] \cdot R[i_2, i_3] \cdots R[i_{k-1}, i_k] \cdot R[i_k, i_1] > 1 \]

Analyze the running time of your algorithm.

4. Show the execution of the Bellman-Ford algorithm on the graph provided with this homework.