Problem 1: Suffix trees
Describe how you can efficiently (in linear time) determine the following using a suffix tree data structure.

(a) a longest match between $x$ and $y$

(b) a longest unique match between $x$ and $y$ if it exists

(c) a longest repeat in $x$

(d) a longest non-overlapping repeat in $x$

Problem 2: RNA secondary structure
In this problem we assume that the RNA does not form knots.

(a) Given RNA $r = AUGGCAUCCGUA$, find a secondary structure with the maximum number of base pairs.

(b) Given RNA $r = r_1 ... r_n$, show that if $r_1$ and $r_n$ are complementary bases, then there is a secondary structure with maximum number of base pairs that contains the pair $(r_1, r_n)$.

(c) Assume that the RNA structure cannot fold sharply, so every hairpin loop has a length of at least $t$ unpaired bases. Modify the Nussinov algorithm we saw in class to obtain a minimum energy secondary structure with no sharp folds.

(d) Describe how you can use Nussinov algorithm (with and without the variation in (c)) to find a minimum energy secondary structure for a circular RNA in $O(n^3)$ time.