Разное.

1. Given a Set Cover instance (U, F, k), the minimum possible size of a subfamily $F' \subset F$ that covers U can be found in time $2^{|U|}(|U|+|F|)^{O(1)}$. Prove above mentioned fact.

2. Given a directed graph G, a set of terminals $K \subset V(G)$ and a root $r \in V(G)$, Directed Steiner Tree asks for a directed tree rooted at r such that every terminal in K is reachable from r on the tree. Obtain a $3^K n^{O(1)}$ time algorithm for Directed Steiner Tree.

3. In the Max Leaf Subtree problem, we are given a graph G together with an integer k and the question is whether there is a subtree T of G with at least k leaves.

   (a) Show that (G, k) is a yes-instance if and only if $K_{1,k}$ (a graph with a center vertex connected to k degree-one vertices) is a minor of G.

   (b) Deduce that Max Leaf Subtree is non-uniformly fixed-parameter tractable, when parameterized by k.

4. In the Planar Diameter Improvement problem, the input consists of a planar graph G and an integer k, and the task is to check if there exists a supergraph of G that is still planar, and at the same time has diameter at most k.

   (a) Prove that this problem is non-uniformly fixed-parameter tractable, when parameterized by k.

   (b) Show that it only suffices to consider supergraphs G' of G with $V(G') = V(G)$ that is, it makes sense only to add edges to G, but adding new vertices does not help.

5. In the Cycle Packing problem the input is a graph G with an integer k and the task is to determine whether there exist k cycles in G that are pairwise vertex disjoint. Prove that this problem is non-uniformly fixed-parameter tractable, when parameterized by k.