Exercise sheet 6 – Solutions and Hints

COMP6741: Parameterized and Exact Computation

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Exercise 1. A *cluster graph* is a graph where every connected component is a complete graph.

Cluster Editing	
Input:	Graph $G = (V, E)$, integer k
Parameter:	k
Question:	Is it possible to edit (add or delete) at most k edges of G so that it becomes a cluster graph?

Recall that G is a cluster graph iff G contains no induced P_3 (path with 3 vertices) and has a kernel with $O(k^2)$ vertices.

1. Design an algorithm for Cluster Editing with running time $3^k \cdot k^{O(1)} + n^{O(1)}$.

Solution sketch.

- Kernelize to obtain an equivalent instance (G', k') on $O(k^2)$ vertices in $n^{O(1)}$ time
- As a branching strategy, select an induced P_3 (u, v, w) and recursively check whether any of the following graphs can be edited into a cluster graph with at most $k-1$ edge edits: the graph where we remove the edge uv, the graph where we remove the edge vw, and the graph where we add the edge uw to G'.