

Exercise sheet 2b
COMP6741: Parameterized and Exact Computation

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19T3

Exercise 1. Consider the following approximation algorithm for the VERTEX COVER optimisation problem.

- $S \leftarrow \emptyset$
- As long as $E \neq \emptyset$, do
 - Select an arbitrary edge $uv \in E$
 - $S \leftarrow S \cup \{u, v\}$
 - $G \leftarrow G - \{u, v\}$
- Return S

Show that this is a 2-approximation algorithm for VERTEX COVER.

Exercise 2. A k -coloring of a graph $G = (V, E)$ is a function $f : V \rightarrow \{1, 2, \dots, k\}$ such that $f(u) \neq f(v)$ if $uv \in E$.

SAVING COLORS

Input: Graph G , integer k

Parameter: k

Question: Does G have a $(n - k)$ -coloring?

Design a kernel for SAVING COLORS with $O(k)$ vertices.

Recommendation: use the Crown Lemma.