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Problem Set 5
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Parameterized Algorithms Tutorial

Tutorial Exercise T13

Let G be a graph and $S \subseteq V(G)$ some vertex subset. Show that the following properties are MSO-expressable:

- S is a vertex cover of G
- S is an independent set of G
- G is a connected graph
- S induces a cycle in G
- G has a hamiltonian path
- S induces an even cycle in G

Tutorial Exercise T14

Which of the following graph properties are closed under taking minors?

- Acyclicity
- Chordality
- Planarity
- Bipartiteness
- Connectivity
- bounded degree
- having a $\leq k$-vertex cover

Homework H10
Let G be a graph and $S \subseteq V(G)$ some vertex subset. Show that the following properties are MSO-expressable:

- S is a dominating set of G
- S induces a path in G
- S induces an even path in G
- S induces an odd cycle in G
- G is 3-colorable

Homework H11
Which of the following graph properties are closed under taking minors?

- Bounded diameter
- Bounded average degree
- Distance k to planarity, i.e. one can delete at most k vertices from the graph to make it planar
- 3-Colorability
- excluding some fixed graph H as a minor

The average degree of a graph $G = (V, E)$ is defined as $d_{avg} = \frac{1}{|V|} \sum_{v \in V} d(v)$. A classical result, the handshaking lemma, implies that it can also be calculated as $d_{avg} = \frac{2|E|}{|V|}$