# Blocks

- Read section 5.2, pages 111-114
  - When do we call a graph **nonseparable**?
  - Prove theorem 5.7: A graph of order at least $3$ is nonseparable if and only if every two vertices lie on a common cycle.
    * In the forward direction part of the proof, the case of $d(u, v) = 1$ is handled right-away by the fact that the graph has no bridges. Explain.
    * Explain how the inductive step for that direction works, in particular figure 5.3.
  - What do we refer to as a **block** in a separable graph?
  - What are the blocks in a path graph? In a cycle graph? A complete graph?
  - Looking at Figure 5.4, make sure you understand why the identified graphs are blocks.
  - Practice on exercise 5.9.
  - If a vertex is a cut-vertex of a graph, is it also a cut-vertex of any induced subgraph that contains it?
  - Prove theorem 5.8: The relation $R$ on edges defined by $eRf$ iff $e = f$ or if $e$ and $f$ lie on the same cycle is in fact an equivalence relation. You will need to show it is reflexive, symmetric and transitive. Make sure to draw a graph of the proof of transitivity.
  - Show that the graph induced by the edges of any one of the equivalence classes is a block (i.e. you have to show that it is nonseparable, and also that it cannot be extended).
  - Prove corollary 5.9: Distinct blocks are edge-disjoint, have at most one vertex in common, and if they do have a vertex in common then it is a cut-vertex of the graph.
  - Work out exercise 5.10.
  - Practice problems: 5.12, 5.13