Professor Dr. Stephan Held
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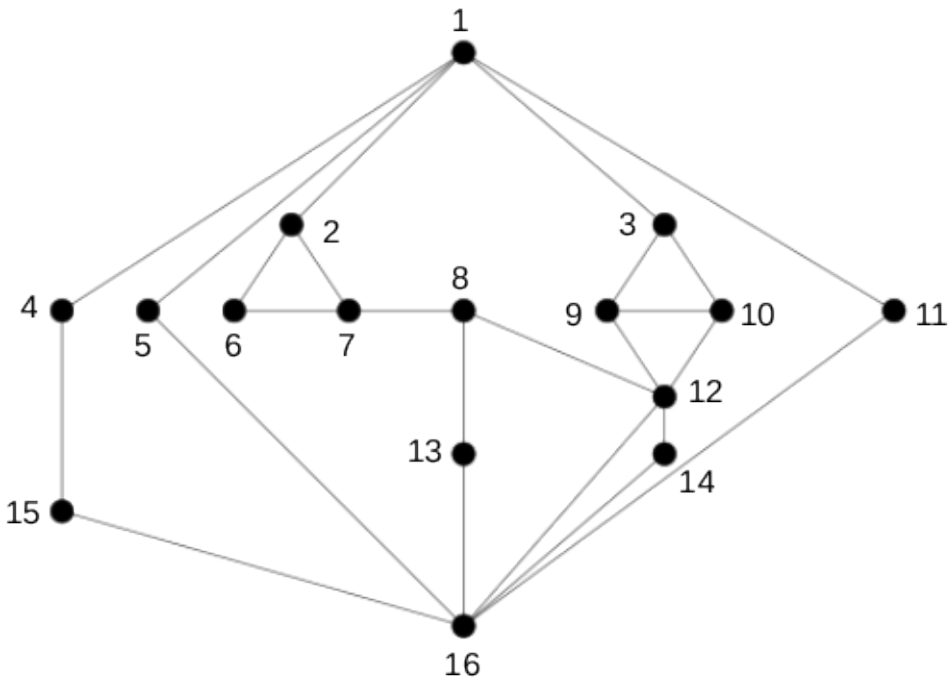
Exercise Set 3

Figure 3.1: Graph for exercise 3.1



Exercise 3.1. Find a maximum matching in the graph in Figure 3.1 together with a certificate for its maximality.

(4 points)

Exercise 3.2. Let G be a 3-regular undirected graph.

(a) Assume G is simple. Show that there is a matching in G covering at least $(7/8) \cdot |V(G)|$ vertices.

(b) Give an example to prove that the bound of item (a) is tight.

(c) Show that the assumption that G is simple in item (a) is necessary.

(4+1+1 points)

Exercise 3.3. Show that a graph G is factor-critical if and only if G is connected and for every vertex $v \in V(G)$ we have $\nu(G - v) = \nu(G)$.

(4 points)

Exercise 3.4. Let G be a k-vertex-connected graph which has neither a perfect nor a near-perfect matching.

(i) Show that $\nu(G) \geq k$.

(ii) Show that $\tau(G) \leq 2 \cdot \nu(G) - k$.

(3+3 points)

Deadline: October 31st, before the lecture. The websites for lecture and exercises can be found at:

`http://www.or.uni-bonn.de/lectures/ws19/co_exercises/exercises.html`

In case of any questions feel free to contact me at rabenstein@or.uni-bonn.de.