

1. For any triple of positive integers $a \geq b \geq c$, prove that there exists a graph G such that $\delta(G) = a$, $\kappa_1(G) = b$ and $\kappa(G) = c$.
2. Let $k \geq 2$. Prove that if G is k -connected, then for any k vertices in G , there exists a cycle which contains these k vertices.
3. For random graph model G^p with p a fixed constant, $1 \geq p > 0$, prove that almost all graphs are k -connected provided k is a given positive integer.
4. Use the adjacency matrix $A(G)$ of G to find the number of different 5-cycles in G .
5. Let G be a 3-regular graph with girth $k \geq 3$. Prove that if G is of minimum order, then G is 3-connected. (*)
6. Say something (as much as possible) about strongly regular graphs and distance regular graphs.