1. Fun Counting Edges

Prove the following claims: In any graph, the number of vertices of odd degree is even.

2. Color the graph

Suppose that the degrees of the vertices in a graph are all at most $d$. Prove, using the well-ordering principle, that one can color the vertices of the graph using at most $d + 1$ colors so that no two adjacent vertices end up having the same color.

3. Introduction to Trees

Recall that a tree is a connected graph with no cycles, (and so no self-loops, and no multi-edges). Show that any tree with at least 2 nodes must have a node of degree 1.
4. Graph Gardening

Prove that if graph $G$ is a tree with $e$ edges and $n$ nodes, then $e = n - 1$. Use induction on $n$. 