

Two paths in a graph are called *edge-disjoint* if they have no edges in common.

Show that in any undirected graph, it is possible to pair up the vertices of odd degree and find paths between each such pair so that all these paths are edge-disjoint.

Let us pick a number of odd number vertices, and quantify it as $2k$. Then pair up these vertices, and put separate them by a node-edge-node combination. Then the added edges will make none of the k to k sub-vertices directly connected. Hence we have a edge-disjoint graph.