

Nearly Platonic graphs

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Abstract

A Platonic graph is a vertex-regular planar graph with all faces of the same size. It is well known that there exist exactly five such graphs: tetrahedron, octahedron, hexahedron, icosahedron, and dodecahedron.

Recently, William Keith asked whether there exist *1-nearly Platonic graphs* that would differ from Platonic in just one face. That is, vertex-regular planar graphs with all faces except one having the same size. W. Keith, D. Kreher and the speaker showed that there are no 2-connected 1-nearly Platonic graphs. We extend the non-existence result to graphs with connectivity one.

On the other hand, there are well known classes of 2-nearly Platonic graphs with exactly two exceptional faces, both of the same size. We will and ask (and partially answer) some questions about 2- and 3-nearly Platonic graphs. In other words, about vertex-regular planar graphs with exactly two or three exceptional faces.

Keywords: planar graph, Platonic graph, nearly Platonic graph.