

Also available at <http://amc-journal.eu>
ISSN 1855-3966 (printed edn.), ISSN 1855-3974 (electronic edn.)
ARS MATHEMATICA CONTEMPORANEA 10 (2016) 223–235

Isospectral genus two graphs are isomorphic

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Abstract: By a graph we mean a finite connected multigraph without bridges. The genus of a graph is the dimension of its homology group. Two graphs are isospectral if they share the same Laplacian spectrum. We prove that two genus two graphs are isospectral if and only if they are isomorphic. Also, we present two bridgeless genus three graphs that are not isomorphic. The paper is motivated by the following open problem posed by Peter Buser: are isospectral Riemann surfaces of genus two isometric?

Keywords: Graph, Laplacian spectrum, isospectral graphs, Laplacian polynomial, spanning tree.

Math. Subj. Class.: 05C50, 15A18, 58J53

Izospektralni grafi roda 2 so izomorfni

Povzetek: Graf nam v tem članku pomeni: končen povezan multigraf brez mostov, rod grafa pa: dimenzijo njegove homološke grupe. Dva grafa sta izospektralna, če si delita isti Laplaceov spekter. Dokažemo, da sta dva grafa roda 2 izospektralna natanko tedaj, ko sta izomorfna. Predstavimo tudi dva brezmostna grafa roda 3, ki pa nista izomorfna. Motivacija za ta članek je bil naslednji odprti problem, ki ga je zastavil Peter Buser: Ali so izospektralne Riemannove ploskve roda 2 izometrične?

Ključne besede: Graf, Laplaceov spekter, izospektralni grafi, Laplaceov polinom, vpeto drevo.