MATH1510 Discrete Mathematics
Semester 2, 2017

Assignment 5

Due Date: This assignment is due in your workshop in week 6. You are also required submit it electronically through Blackboard.

1. Let $S = \{0, 1, 2, 3, 4\}$. Let R be the binary relation on S such that aRb if and only if $a + b = 3$ and $a \leqslant b$.

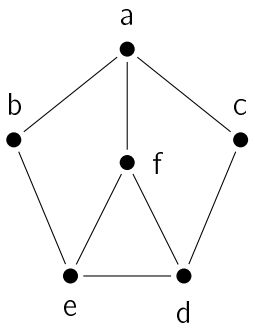
(a) Write this relation down as a subset of the Cartesian product $S \times S$.

(b) Represent this relation by its adjacency matrix.

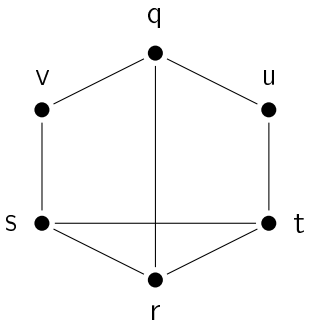
(c) Represent this relation by its arrow diagram.

(d) Represent this relation by its digraph.

2. Prove that the following two graphs are isomorphic, i.e., write down an isomorphism between them.

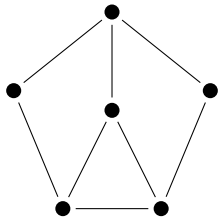


G_1



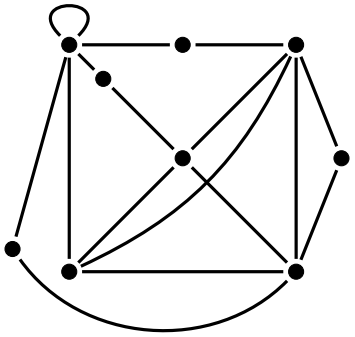
G_2

3. Draw the dual graph for the following graph.

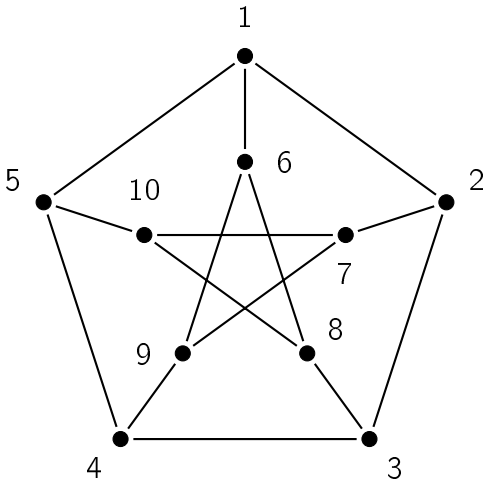


4. What is the maximum number of edges in a simple, planar graph on 7 vertices? Draw two nonisomophic simple, planar graphs on 7 vertices that have this many edges. Clearly state why your graphs are not isomorphic.

5. Is the following graph planar? If not why? If yes draw a planar configuration.



6. (Challenge question) Show that the Petersen graph is not planar by finding a subgraph that is homeomorphic to K_5 or $K_{3,3}$.



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