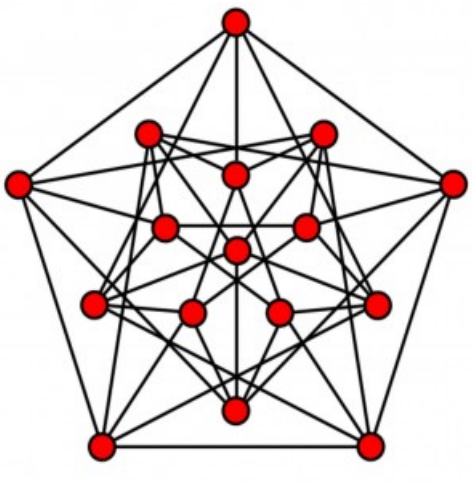
MTH 661/2/3: ALGEBRAIC GRAPH THEORY I, II, and III

Instructor: J. J. P. Veerman

Term: Fall 2017, Winter 2018, Spring 2018

This is an advanced course in graph theory and its applications. This year we will concentrate on the graph Laplacian and its eigenvectors and eigenvalues. These of are fundamental importance when studying phenomena related to flocking. We will study the Perron-Frobenius Theorem, the relation between invariant measures for random walks on directed graphs and their Laplacians. Nodal domains. We will discuss some applications of these ideas, in particular the convergence (or lack thereof) of the movement of a flock to coherent movement. If time permits other applications such as epidemics on graphs will be included.

In addition we will study some aspects of topological graph theory. We will discuss embeddings of graphs in surfaces and embeddings of minimal separating graphs in surfaces using rotation systems. Time permitting we will study least separated genus and largest irreducibly separated genus, genus distributions, and crossing numbers.



Textbooks:
D. B. West, *Introduction to Graph Theory*, 2nd edn, **Prentice Hall**, 2001.
T. Biyikoglu, J. Leydold, P. F. Stadler, *Laplacian Eigenvectors of Graphs*, **Springer**, 2007.
handbok of Graph Theory, 2nd edn, editors: J. L. Gross, J. Yellen, P. Zhang, **CRC Press**, 2013.

Prerequisite: MTH 462/562. This is a sequence of three courses, and they must be taken in sequence.