

Cal Poly Pomona Mathematics and Statistics Department Colloquium

Symmetric groups and Ramanujan graphs

By

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Abstract: Think of a graph as a communications network, where the vertices represent entities (e.g., people, computers) communicating with one another, and two vertices are connected by an edge iff the two entities can communicate directly with one another. An invariant called the expansion constant measures how fast a message originating in some set of vertices will propagate to the entire network. Roughly speaking, it turns out that the expansion constant will be large if the eigenvalues of the graph's adjacency matrix are small. Lubotzky, Phillips, and Sarnak define a graph to be Ramanujan if these eigenvalues are, in a certain sense, as small as possible. One can use group theory to construct certain graphs called Cayley graphs. The eigenvalues of Cayley graphs (and other related graphs) are determined by objects called group characters. In this talk, I'll define all of these terms and show that by applying this theory to the special case of the symmetric group, we can construct an infinite family of Ramanujan graphs. As a corollary to these findings, we also obtain purely algebraic information about the symmetric group.

Thursday, October 19th, 2006, 12:05 – 12:50 p.m. in 8-156
Refreshments served at 12 noon.