Discrete Mathematics Seminar

Time: Friday, 1 April 2011, 1:10–1:45 PM
Location: 238 Derrick Hall
Title: Sum Rules for the Resistance Distance
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Abstract:

Let $G$ be a connected graph. The resistance distance between any two vertices of $G$ is defined as the net effective resistance between them if each edge of $G$ is replaced by a unit resistor.

In this talk, first of all, we establish a pair of general sum rules for resistance distances in $G$. Then for any $S \subseteq V(G)$ such that all vertices in $S$ have the same neighborhood $N$ in $G - S$ and $2 \leq |S| \leq 4$, by these rules, we derive simple formulae for resistance distances between vertices in $S$ in terms of the cardinality of $N$, which indicates that resistance distances between vertices in $S$ depend only on the cardinality of $N$ and the induced subgraph $G[S]$. One question arises naturally: does this property hold for $S$ with arbitrarily many vertices? Finally, we answer this question by the following reduction principle: resistance distances between vertices in $S$ can be computed as in the subgraph obtained from $G[S \cup N]$ by deleting all the edges between vertices in $N$. 