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THE NONAMENABILITY OF SCHREIER GRAPHS
FOR INFINITE INDEX QUASICONVEX
SUBGROUPS OF HYPERBOLIC GROUPS

by Ilya KAPOVICH

ABSTRACT. We show that if H is a quasiconvex subgroup of infinite index in a nonelementary hyperbolic group G then the Schreier coset graph for G relative to H is nonamenable.

1. INTRODUCTION

A connected graph of bounded degree X is *nonamenable* if X has nonzero Cheeger constant or, equivalently, if the spectral radius of the simple random walk on X is less than one (see Section 2 below for more precise definitions). Nonamenable graphs play an increasingly important role in the study of various probabilistic phenomena, such as random walks, harmonic analysis, Brownian motion, and percolations on graphs and manifolds (see for example [2, 5, 6, 7, 15, 17, 18, 24, 30, 43, 44, 62, 71, 72]), as well as in the study of expander families of finite graphs (see for example [52, 66, 67]).

It is well-known that a finitely generated group G is nonamenable if and only if the Cayley graph of G with respect to some (any) finite generating set is nonamenable. The notion of a *word-hyperbolic group* was introduced by M. Gromov [40] and has played a central role in Geometric Group Theory for the last fifteen years. Word-hyperbolic groups are nonamenable unless they are virtually cyclic. Thus the Cayley graphs of word-hyperbolic groups provide a large and interesting class of nonamenable graphs. In this paper we investigate nonamenability of Schreier coset graphs corresponding to subgroups of hyperbolic groups.