

Zeitschrift: L'Enseignement Mathématique
Herausgeber: Commission Internationale de l'Enseignement Mathématique
Band: 43 (1997)
Heft: 3-4: L'ENSEIGNEMENT MATHÉMATIQUE

Artikel: AMENABILITY AND GROWTH OF ONE-RELATOR GROUPS
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Kurzfassung
DOI: <https://doi.org/10.5169/seals-63284>

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AMENABILITY AND GROWTH OF ONE-RELATOR GROUPS

by Tullio G. CECCHERINI-SILBERSTEIN and Rostislav I. GRIGORCHUK

ABSTRACT. An algorithm showing whether a group given by a one-relator presentation is amenable or not is constructed. Sufficient conditions for a one-relator group of exponential growth to have uniformly exponential growth are also given.

0. INTRODUCTION

A one-relator group is a group G which admits a presentation

$$(*) \quad G = \langle a_1, a_2, \dots, a_m : R(a_1, a_2, \dots, a_m) = 1 \rangle$$

with one defining relation.

The paper by G. Baumslag [B 1] is a comprehensive survey of results about one-relator groups. In particular this paper stresses the role of algorithmic problems in the theory of one-relator groups.

Recently the interest in functional-analytical and asymptotical properties of one-relator groups has increased. For instance, the entropy of one-relator groups was discussed in [GrLP], random walks and Markov operators on one-relator groups were investigated in [CV], [BCCH], [BC], and the K-functor of reduced C^* -algebras of one-relator groups was computed in [BBV]. Also the growth functions of the groups $\Gamma_n = \langle t, a : tat^{-1} = a^n \rangle$, $n \neq 0, \pm 1$, and of some other one-relator groups were calculated in [CEG] and [EJ].

Recall that a discrete group G is amenable if there exists a finitely additive measure $\mu: \mathcal{P}(G) = \{0, 1\}^G \longrightarrow [0, 1]$ which is G -(left)-invariant ($\mu(gE) = \mu(E)$ for all $g \in G$ and $E \subset G$) and such that, in addition, $\mu(G) = 1$. For our purpose it will be enough to know that a group containing a free subgroup of rank two is not amenable, and that, on the contrary, any solvable group is amenable ([G]).