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Title: Growth of Groups

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Abstract: Let G be a finitely generated group with a finite generating set $\{s_1, s_2, \dots, s_n\}$. We define the length $l(g)$ of $g \in G$ to be the number of generators required in the shortest decomposition of $g = y_1 y_2 \dots y_k$, where each y_i is either a generator or the inverse of generator. Then we can define a metric d on G given by $d(g, h) = l(gh^{-1})$. Now, if $B(e; r)$ denotes the ball of radius r centred at identity, then define a function $G(r) : \mathbb{N} \rightarrow \mathbb{N}$ given by $G(r) = |B(e; r)|$, which counts the size of balls. The growth rate of group is the study of the asymptotic behaviour of this function $G(n)$. Depending on the nature of this function, we can classify the growth type into polynomial, exponential and intermediate. Here, we try to understand these growth functions and their properties. The asymptotic nature of this function provides us with a lot of information pertaining to the group.


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