

Combinatorics of infinite sums of Brooks quasimorphisms

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Abstract: Grigorchuk's Density Theorem states that any alternating real-valued quasimorphism of a free group may be expressed as an infinite sum of Brooks quasimorphisms. It is not clear which sums give rise to actual quasimorphisms, something which was already discussed in Grigorchuk's paper. However, when we restrict to Brooks quasimorphism on non-self-overlapping words, the question becomes more approachable, and such sums may be studied combinatorially. We will discuss these quasimorphisms, giving a partial result which suggests that they may be enough to describe the whole bounded cohomology of the free group. Time permitting, we will discuss some subfamilies that fall into Heuer's framework of decompositions, yielding new trivial cup products.