A CLASS OF SUMS WITH UNEXPECTEDLY HIGH CANCELLATION

HAMED MOUSAVI

ABSTRACT. In this talk we report on the discovery of a general principle leading to an unexpected cancellation of oscillating sums, of which $\sum_{n^2\leq x}(-1)^n e^{\sqrt{x-n^2}}$ is an example (to get the idea of the result). It turns out that sums in the class we consider are much smaller than would be predicted by certain probabilistic heuristics. After stating the motivation, we show a number of results in integer partitions. For instance we show a "weak" version of pentagonal number theorem

$$\sum_{\ell^2<x}(-1)^\ell p(x-\ell^2) \ \sim \ 2^{-3/4}x^{-1/4}\sqrt{p(x)},$$

where $p(x)$ is the usual partition function. This is a joint work with Ernie Croot.