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Trace functions and all that

Outline:

- Reminders of the setting + another example
 - Trace functions: philosophy
+ super-quick-summary
 - Trace functions: definition
and explanation
 - sketch of proof of basic th.
- } • quasi-orth.
+
• Fourier transform

Recall from Philippe's talk the situation: given a function $K: \mathbb{Z}/p\mathbb{Z} \rightarrow \mathbb{C}$, where p is a prime, we need to estimate sums of the type

where

$$\mathcal{E}(K, \gamma) = \sum_{z \in \mathbb{Z}/p\mathbb{Z}} \widehat{K}(\gamma \cdot z) \overline{K(z)}$$
$$\widehat{K}(z) = \frac{1}{\sqrt{p}} \sum_{x \bmod p} K(x) e\left(\frac{zx}{p}\right)$$

is the Fourier transform of K .

Precisely, we wish to know that for some $M \gg 1$, those $\gamma \in \text{PGL}_2(\mathbb{F}_p)$ s.t.

$$|\mathcal{E}(K, \gamma)| > M p^{1/2}$$

①