

Math 301: Optional Homework

Due Wednesday November 28

1. Let q be a prime power and $A \subset \mathbb{F}_q \times \mathbb{F}_q$ be a Sidon set with $|A| = q$. Is it true that A can always be represented as

$$A = \{(p(x), q(x)) : x \in \mathbb{F}_q\}$$

where p and q are polynomials of degree at most 2?

2. Let $A \subset \mathbb{F}_q \times \mathbb{F}_q$ be a Sidon set with $|A| = q - 1$. Is it always true that there exists an element $g \in (\mathbb{F}_q \times \mathbb{F}_q) \setminus A$ such that $A \cup \{g\}$ is also a Sidon set?
3. Can you cover 99% of an isosceles right triangle with fewer than 99 non-overlapping rectangles that have sides parallel/perpendicular to the short legs of the triangle (all completely within the triangle)?