1. Let $E$ be an elliptic curve over $\mathbb{F}_q$.
   (i) Let $d$ be any positive integer. By representing $E[d]$ as the kernel of an isogeny, show that $|E[d]| \leq d^2$.
   (ii) Show that $E(\mathbb{F}_q) \cong \mathbb{Z}/m \times \mathbb{Z}/mn$ for some positive integers $m, n$ with $\gcd(m, q) = 1$. (You may quote previous homeworks.)
   (iii) Look up what the Weil pairing is. Assuming its existence, show that $q \equiv 1 \pmod{m}$.
   (iv) Either find an elliptic curve $E$ over some prime field $\mathbb{F}_p$ with $E(\mathbb{F}_p) \cong \mathbb{Z}/11 \times \mathbb{Z}/11$ or else show that no such $p$ and $E$ exist.