

Name: _____

Directions: Show all work. No credit for answers without work.

1. [**2 parts, 4 points each**] Let $p = 67$ and let E be the elliptic curve given by $y^2 = x^3 + 9x + 33$ over \mathbb{F}_p . Let $P = (42, 53)$ and $Q = (62, 8)$. Compute the following points.

(a) P^2

(b) $\frac{P}{Q}$ and $\frac{Q}{P}$

2. [**2 points**] Let $p = 11$, let $P = (1, 2)$ and $Q = (2, 3)$. Find A and B such that P and Q are both on the elliptic curve over \mathbb{F}_p given by $y^2 = x^3 + Ax + B$.