1) Compute the following mod 23: (50 points)

$$14 + 5 \cdot 6$$

2) Define what it means for a number in $\mathbb{Z}$ to be <u>prime</u>. (25 points)

3) Define what it means for a number in $\mathbb{Z}$ to be <u>irreducible</u>. (25 points)

4) Let $p$ be a prime number in $\mathbb{Z}$. Prove that $p$ is irreducible. (100 points)

5) Use the extended Euclidean Algorithm to solve $3x + 8y = 1$ for integer solutions. Show every step. (100 points)