

Homework 11, due September 28

- (1) (Page 110, problem 33) Show that the only irreducible polynomials in $\mathbb{Z}_2[X]$ of degree at most 2 are X , $X + 1$, and $X^2 + X + 1$. Show that $X^4 + X + 1$ is irreducible in $\mathbb{Z}_2[X]$.
- (2) Show that $X^2 + 2$ is irreducible in $\mathbb{Z}_5[X]$. Find the multiplicative inverse of $1 + 2X$ in $\mathbb{Z}_5[X] \pmod{X^2 + 2}$.
- (3) Construct a finite field with 9 elements and write down the addition and multiplication tables.