

Homework I

Due: January 20, 2009

1. The sequence

39 48 29 34 55 73 3 4 33 40 11 13 21 22

encoding an important message by using the matrix $M = \begin{pmatrix} 1 & 3 \\ 1 & 4 \end{pmatrix}$ have been received. Decode the message, assuming that the blank is zero and

$$A = 1, B = 2, C = 3, \dots, O = 15, P = 16, Q = 17, R = 18, \dots, y = 25, Z = 26.$$

2. The following ISBN: **2 - 251 - 13 ■ 54 - 9** has been received with smudge. What is the missing digit?

In all that follows, all polynomials are in $\mathbb{K}[x]$.

3. Divide the polynomial $P(x) = 1 + x^7$ by $1 + x^2$, $1 + x^2 + x^3$, and $1 + x^2 + x^4$.
4. Simplify

$$P(x) = (1 + x^3 + x^5)^2(1 + x^4)^3(1 + x + x^3 + x^5)^2.$$

5. Let $P(x) = (1 + x^6)(1 + x^3)$ be a polynomial, then find

$$P(x) \bmod (1 + x^n) \quad \text{and} \quad P^2(x) \bmod (1 + x^n), \quad \text{where } n = 7, 8, 9, 10.$$