to be prepared for December 12

Exercise 41. Compute the factorization in GF(8)$[x]$ into irreducible factors of the polynomial

$$f = \alpha x^{14} + x^{13} + x^{12} + x^{11} + x^{10} + x^9 + x^8 + x^7 + x^6 + x^5 + x^4 + x^3 + (1+\alpha)x^2$$

where α is a root of the polynomial $1 + x + x^3 \in \mathbb{Z}_2[x]$.

Exercise 42. Compute the factorization in GF(27)$[x]$ of the squarefree polynomial

$$x^{10}+(1+\alpha^2+\alpha)x^9+(2\alpha+\alpha^2+1)x^7+(2\alpha^2+2)x^6+(\alpha+\alpha^2)x^4+(2+2\alpha+\alpha^2)x^3+(1+\alpha^2+\alpha)x^2+(1+\alpha)x+1+\alpha$$

into irreducible factors, where α is a root of the polynomial $1 - x + x^3 \in \mathbb{Z}_3[x]$.

Exercise 43. Compute the factorization of the polynomial

$$x^{19} + 14x^{18} + 23x^{17} + 3x^{16} + 22x^{15} + 25x^{14} + 27x^{13} + 22x^{12} + 58x^{11} + 38x^{10} +$$
$$+42x^9 + 74x^8 + 55x^7 + 68x^6 + 62x^5 + 38x^4 + 39x^3 + 18x^2 + 7x + 4$$

into irreducibles in $\mathbb{Z}[x]$ by the modular method.