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ECE 404 - HW 4

In GF(13):

1. (a) $(7x^4 + 3x^3 + x^2 + 10) - (9x^4 + 6x^3 + 7x^2 + 8x + 2)$

$= 11x^4 - 3x^3 + 7x^2 - 8x + 8$

$= 11x^4 + 10x^3 + 7x^2 + 5x + 8$

(b) $(7x^3 + 2x + 9) \times (2x^3 + x^2 + 8x + 7)$

$= 14x^6 + 4x^4 + 18x^3 + 7x^5 + 2x^3 + 9x^2 + 56x^4 + 16x^2 + 72x + 49x^3 + 14x + 63$

$= x^6 + 4x^4 + 5x^3 + 7x^5 + 2x^3 + 9x^2 + 4x^4 + 3x^2 + 7x + 10x^3 + x + 11$

$= x^6 + 7x^5 + 8x^4 + 4x^3 + 12x^2 + 8x + 11$

(c) $3x^3 + 4x^2 + 3 \;\overline{)\; 12x^5 + 4x^4 + 36x^3 + 12x^2 + x}$

$4x^2 + 9x$

$-(12x^5 + 3x^4 + 12x^2)$

$x^4 + 36x^3 + x$

$x^4 + 10x^3 + x$

$= x^4 + 10x^3 + x$

$\frac{12}{3} \to 12 \cdot 9 \to 108 \bmod 13 \to 4$

$\frac{1}{3} \to 1 \cdot 9 \to 9 \bmod 13 \to 9$

$\boxed{4x^2 + 9x}$

In GF(2^3) w/ mod polynomial: $x^3 + x + 1$

2. (a) $(x^2 + x + 1) \cdot (x + 1)$

$= x^3 + x^2 + x + x^2 + x + 1$

$= x^3 + 2x^2 + 2x + 1 \quad \bmod x^3 + x + 1$

$\Rightarrow x^3 + x + 1 \;\overline{)\; x^3 + 2x^2 + 2x + 1}$ (quotient: 1)

$-(x^3 + x + 1)$

$2x^2 + x \to \boxed{1x}$

(b) $(x + 1) - (x^2 + x + 1)$

$= -x^2 \quad \bmod x^3 + x + 1$

$= x^2$

(c) $\frac{x^2 + x + 1}{x^2 + 1} \Rightarrow x^2 + 1 \;\overline{)\; x^2 + x + 1}$ (quotient: 1)

$-(x^2 + 1)$

x

$= 1 + \frac{x}{x^2 + 1}$