1) GF (11)

a) $\left(9x^5 + 4x^4 + 8x^3 + 2x^2 + 3x + 4\right)$

$+ \left(6x^5 + 2x^4 + 9x^3 + 7x^2 + 5x + 7\right)$

$= 4x^5 + 6x^4 + 6x^3 + 9x^2 + 8x$

b) $\left(8x^3 + 6x^2 + 8x + 1\right) \times \left(3x^3 + 9x^2 + 7x + 5\right)$

$= 24x^6 + 90x^5 + 134x^4 + 157x^3 + 95x^2 + 47x + 5$

$= 2x^6 + 2x^5 + 2x^4 + 3x^3 + 7x^2 + 3x + 5$

c) $\dfrac{3x^3 - 5x^2 + 10x - 3}{3x + 1} = x^2 + 9x + 4 + \dfrac{4}{3x+1}$

$$
\begin{array}{r}
x^2 - 2x + 4 \\
3x+1 \overline{\big)\; 3x^3 - 5x^2 + 10x - 3} \\
\underline{3x^3 + x} \\
-6x^2 + 10x - 3 \\
\underline{-6x^2 - 2x} \\
12x - 3 \\
\underline{12x + 4} \\
-7
\end{array}
$$

2) $GF(2^3)$ Modulus $= x^3 + x + 1$

a) $(x^2 + x + 1) \times (x^2 + x)$

$= (x^4 + x^9 + x^3 + x^2 + x^2 + x) / (x^3 + x + 1)$

$= (x^4 + x) / (x^3 + x + 1)$

$= x^2$

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

c) $\dfrac{x^2 + x + 1}{x^2 + 1} = 1 + x + 1 = x$