

Scratch paper for Math 8510, HW 12

#1: The additive Cayley table of the finite field $\mathbb{F}_9 \cong \mathbb{F}_3[x]/(x^2 + x + 2)$.

A coordinate plane with a horizontal x-axis and a vertical y-axis. The x-axis has tick marks and labels at 0, 1, 2, x , $x+1$, $x+2$, $2x$, $2x+1$, and $2x+2$. The y-axis has tick marks and labels at 0, 1, 2, x , $x+1$, $x+2$, $2x$, $2x+1$, and $2x+2$.

#1: The multiplicative Cayley table of the finite field $\mathbb{F}_9 \cong \mathbb{F}_3[x]/(x^2 + x + 2)$.

\times	1	2	x	$x+1$	$x+2$	$2x$	$2x+1$	$2x+2$
1	1	2	x	$x+1$	$x+2$	$2x$	$2x+1$	$2x+2$
2	2	4	$2x$	$2x+2$	$x+1$	$x+2$	$2x+1$	$2x+4$
x	x	$2x$	1	$x+1$	$x+2$	$2x+2$	$2x+1$	$2x+4$
$x+1$	$x+1$	$x+2$	$2x+2$	1	$x+1$	$x+2$	$2x+1$	$2x+4$
$x+2$	$x+2$	$x+4$	$2x+1$	$x+2$	1	$x+2$	$2x+1$	$2x+5$
$2x$	$2x$	$4x$	$x+1$	$x+2$	$x+2$	1	$x+1$	$x+4$
$2x+1$	$2x+1$	$4x+2$	$2x+2$	$2x+1$	$2x+1$	$x+1$	1	$x+2$
$2x+2$	$2x+2$	$4x+4$	$2x+1$	$2x+2$	$2x+2$	$x+2$	$x+2$	1

#1: The additive Cayley table of the finite field $\mathbb{F}_9 \cong \mathbb{F}_3[x]/(x^2 + x + 2)$.

A Cartesian coordinate system with a horizontal x-axis and a vertical y-axis. The x-axis is labeled with values 0, 1, -1, x , $x+1$, $x-1$, $-x$, $-x+1$, and $-x-1$. The y-axis is labeled with values 0, 1, -1, x , $x+1$, $x-1$, $-x$, $-x+1$, and $-x-1$. The origin is marked with a plus sign (+). The graph of the function $y = |x|$ is plotted as a V-shape opening upwards, passing through the points (0,0), (1,1), (-1,1), (x,x), (x+1,x+1), (x-1,x-1), (-x,-x), (-x+1,-x+1), and (-x-1,-x-1).

#1: The multiplicative Cayley table of the finite field $\mathbb{F}_9 \cong \mathbb{F}_3[x]/(x^2 + x + 2)$.

\times	1	-1	x	$x+1$	$x-1$	$-x$	$-x+1$	$-x-1$
1	1	-1	x	$x+1$	$x-1$	$-x$	$-x+1$	$-x-1$
-1	-1	1	$-x$	$-x-1$	x	$x+1$	$x-1$	$-x$
x	x	$-x$	1	-1	x	$x+1$	$x-1$	$-x$
$x+1$	$x+1$	$-x+1$	-1	1	1	-1	x	$x-1$
$x-1$	$x-1$	$-x+1$	1	-1	-1	1	x	$x+1$
$-x$	$-x$	$x+1$	$x-1$	$-x$	$-x-1$	x	$-x$	1
$-x+1$	$-x+1$	x	$x+1$	$-x$	1	-1	x	-1
$-x-1$	$-x-1$	$x-1$	$-x$	x	-1	1	-1	x