in $\mathbb{Z}_{101}$

$2+2=4$

$2\cdot 2=4$

$2^2=4$

$2^8\equiv 54 \pmod{101}$

$5\cdot 101\equiv 0 \pmod{101}$

in $\mathbb{Z}_7$

$\frac{1}{4}=x:\left(1\equiv 4x \mod 7\right)=2$

$-4\equiv 3 \mod 7$

Define $f(x)=3+2x-x^2$

- $f(0)=3$
- $f(5)=-12\equiv 2 \mod 7$
- $f(x)=0$

$x^2-2x-3\equiv 0 \mod 7$

$x_1=-1\equiv 6 \mod 7 \quad x_2=3$

- Does it form a permutation of the ring? i.e. it maps each element of $\mathbb{Z}_7$ to a unique element in $\mathbb{Z}_7$

$\forall y\in R, \exists! x\in R \text{ s.t. } f(x)=y$

$f(0)=3$

$f(1)=4$ X condition violated. The answer is no.

$f(2)=3$

$f(3)$

$f(4)$

$f(5)$

$f(6)$