

Greetings IZA3

## Inverse functions, Trig

A function assigns a value to each element of its domain  $\text{dom}(f)$

The range of  $f$ ,  $\text{ran}(f)$ , is the set of values which are assigned by the function

e.g.  $f(x) = x^2$      $\text{dom}(f) = \mathbb{R} = (-\infty, \infty)$   
 $\text{ran}(f) = [0, \infty)$

The inverse of a function  $f$  is a function

$f^{-1}$  such that

$f^{-1}(f(x)) = x$  for all  $x$  in ~~the~~  $\text{dom}(f)$

$\text{dom}(f^{-1}) = \text{ran}(f)$

### Examples

A function  $f$  is one-to-one (1-1) (injective)

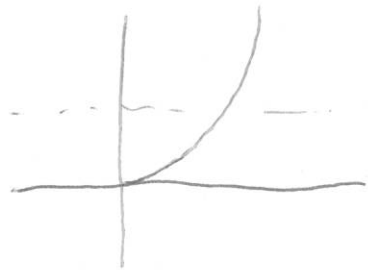
if ~~there is~~  $f$  does not take the same value at two different points in  $\text{dom}(f)$

i.e.  $f(x) = f(y) \Rightarrow x = y$  (for any)

e.g.  $x \mapsto x^2$  with domain  $\mathbb{R}$  is not 1-1

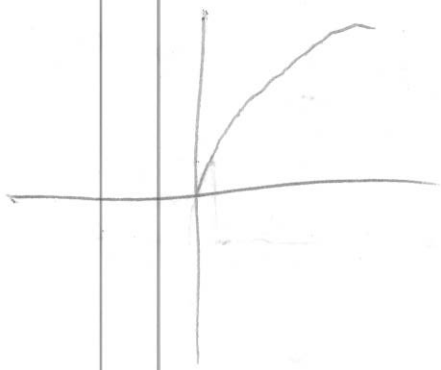
$$x \mapsto x^2$$

dom  $[0, \infty)$   
ran  $[0, \infty)$



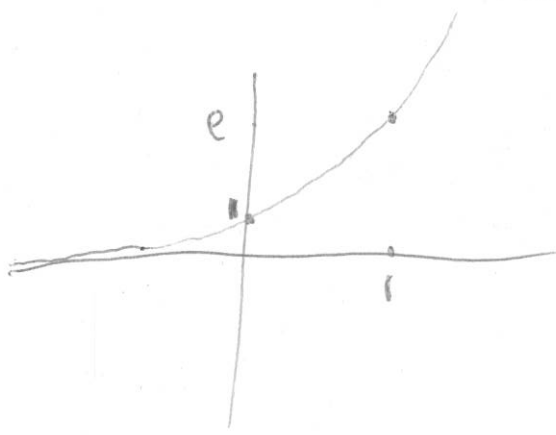
$$x \mapsto \sqrt{x}$$

dom  $[0, \infty)$   
ran  $[0, \infty)$



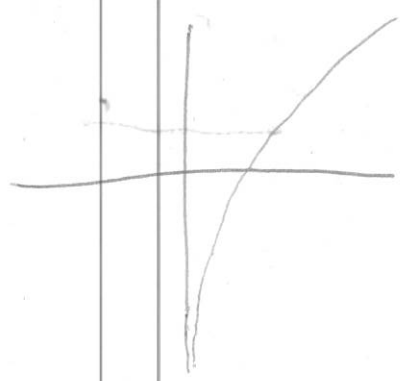
$$x \mapsto e^x$$

dom  $\mathbb{R}$   
ran  $(0, \infty)$



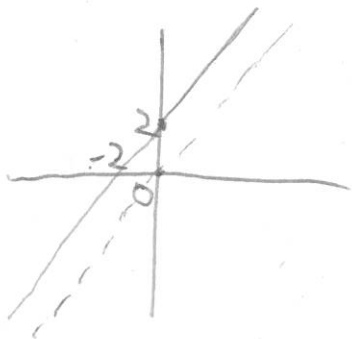
$$x \mapsto \ln x$$

dom  $(0, \infty)$   
ran  $\mathbb{R}$



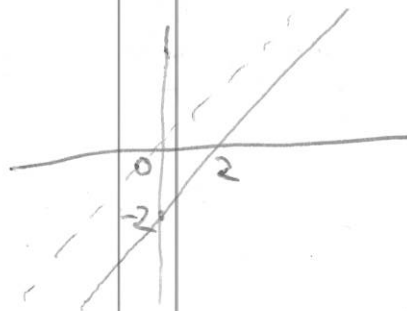
f

$x \mapsto x+2$   
domain  $\mathbb{R}$   
range  $\mathbb{R}$

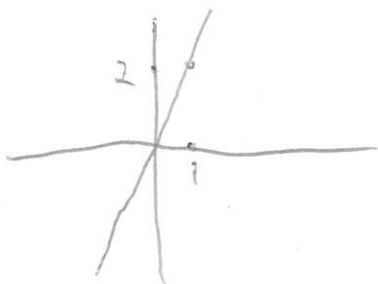


f<sup>-1</sup>

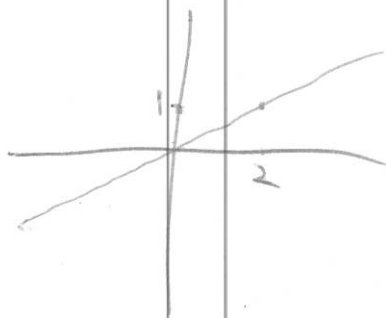
$x \mapsto x-2$   
domain  $\mathbb{R}$   
range  $\mathbb{R}$



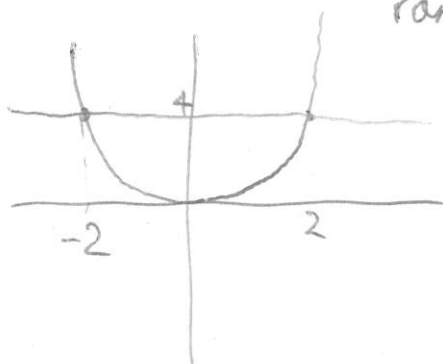
$x \mapsto 2x$



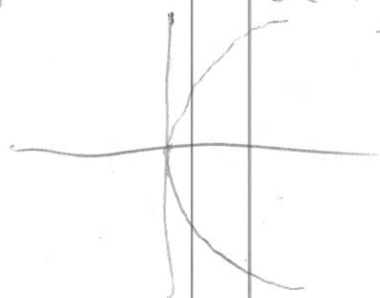
$x \mapsto x/2$



$x \mapsto x^2$  dom  $\mathbb{R}$   
ran  $[0, \infty)$



No Inverse function



$$f^{-1}(f(2)) = 2$$
$$\parallel$$
$$f^{-1}(4)$$

$$f^{-1}(f(-2)) = -2$$
$$\parallel$$
$$f^{-1}(4)$$