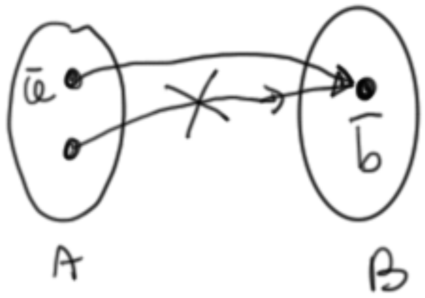
$\varphi : A \to B$ ini + sur $\Rightarrow$

$\Rightarrow \exists\, \psi : B \to A$ $\boxed{\psi \circ \varphi = \iota_A}$ $\boxed{\varphi \circ \psi = \iota_B}$



$\forall \bar{b} \in B \quad \exists!\, \bar{a} \in A \quad \varphi(\bar{a}) = \bar{b}$

$\psi : B \to A$

$\psi(b) =$ l'unico a t.c. $\varphi(a) = b$

$\varphi(\overbrace{\psi(b)}^{a}) = b$

$\psi(\underbrace{\varphi(a)}_{\bar{b}}) = \tilde{a}$

$\psi(b) = a$ con $\varphi(a) = b$

$\psi(\bar{b}) = \tilde{a}$ t.c. $\varphi(\tilde{a}) = \bar{b}$ $\Rightarrow a = \tilde{a}$

$\varphi(a) = \bar{b}$

$\varphi : A \to B \quad \varphi$ è biett.

$\Rightarrow \exists \psi : B \to A$

$\psi \circ \varphi = 1_A \quad \varphi \circ \psi = 1_B$

ψ VIENE CHIAMATA FUNZIONE INVERSA DI φ

φ^{-1}

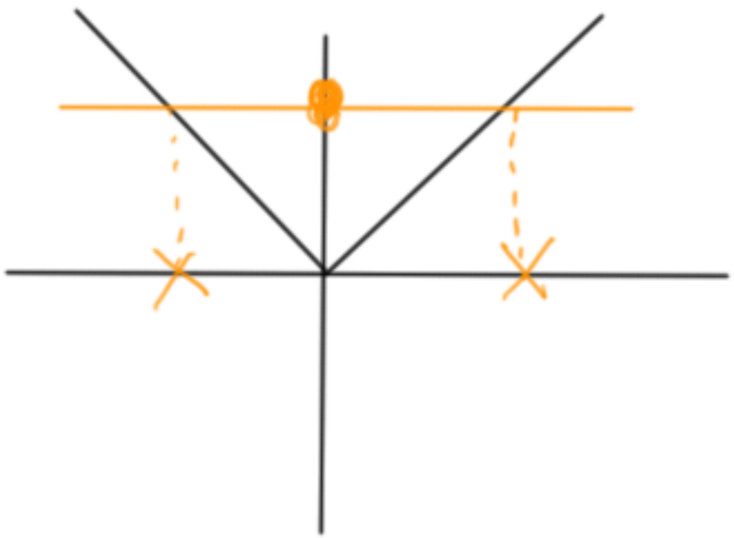
$\varphi^{-1}(b) = a \iff \varphi(a) = b$

$\varphi : A \to B \qquad \varphi$ è biett.

$$\Rightarrow \exists\, \varphi^{-1} : B \to A$$

$$\varphi^{-1} \circ \varphi = \iota_A \qquad \varphi \circ \varphi^{-1} = \iota_B$$

$$\varphi^{-1}(b) = a \iff \varphi(a) = b$$



$$f : \mathbb{R} \to \mathbb{R}$$
$$x \mapsto |x|$$

$f: \mathbb{N} \to \mathbb{N} \quad n \mapsto n^2$

f é INIET ?

$x^2 = y^2 \Rightarrow x = y$

f É SUR. ? $\quad f(\mathbb{N}) = \mathbb{N}$

$\forall x \in \mathbb{N} \; \exists y \in \mathbb{N} \; f(y) = x$

3

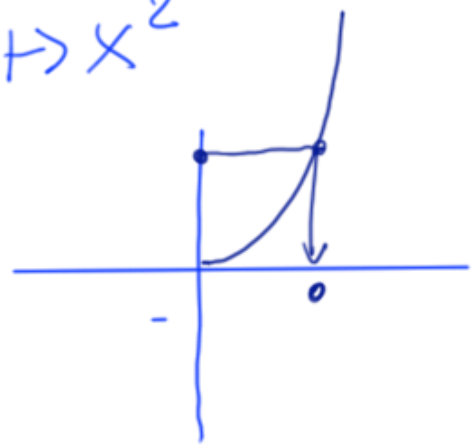
$f:\mathbb{R}\to\mathbb{R} \quad x\mapsto x^2$

1) f INIET $\quad f(-3)=f(3)$

2) f SUR

$f:\mathbb{R}^+\to\mathbb{R}^+ \quad x\mapsto x^2$

$f^{-1}=\sqrt{}$



$f:\mathbb{R}\to\cancel{\mathbb{Q}} \quad x\mapsto x^2$

NON E' UNA FUNZIONE

$$\begin{tikzcd} A \arrow[r, "\varphi_1"] \arrow[rr, bend left, "\varphi_2 \circ \varphi_1"] & B \arrow[r, "\varphi_2"] & C \arrow[ll, bend left, "(\varphi_2 \circ \varphi_1)^{-1}"] \end{tikzcd}$$

φ_1, φ_2 BIIET.

$\Downarrow$

$\varphi_2 \circ \varphi_1$ È BIIET

$$(\varphi_2 \circ \varphi_1)^{-1}$$

$$(\varphi_2 \circ \varphi_1)^{-1} =$$

$$\varphi_1^{-1} \circ \varphi_2^{-1}$$

$$(\varphi_2 \circ \varphi_1) \circ (\varphi_1^{-1} \circ \varphi_2^{-1})$$

$$= \iota_C$$

$$(\varphi_2 \circ \varphi_1) \circ (\varphi_1^{-1} \circ \varphi_2^{-1}) = \varphi_2 \circ (\underbrace{\varphi_1 \circ \varphi_1^{-1}}) \circ \varphi_2^{-1} =$$

$$= (\varphi_2 \circ \iota_B) \circ \varphi_2^{-1} = \varphi_2 \circ \varphi_2^{-1} = \iota_C$$

INSIEMI & RELAZIONI

$A, B \qquad R \subseteq A \times B$

$\downarrow$

RELAZIONE BINARIA

NOTAZIONE

$(a,b) \in R \rightarrow R(a,b)$ -

$\qquad\qquad\;\; \rightarrow aRb$ -

$A = \{a, b, c\}$ $\quad B = \{a, x\}$

$R = \{(a, x), (a, a)\}$ $\quad R \subseteq A \times B$

$A = B$ $\quad R \subseteq A \times A$

RELAZ. BINARIA <u>SU</u> A

$\rho \subseteq \mathbb{N} \times \mathbb{N}$ $\quad \rho = \{(m, n) \mid \exists p \in \mathbb{N} \ m + p = n\}$

$m \rho m \quad (m,m) \in \rho \quad 3 \rho 8 \Leftrightarrow \exists k \ 3 + k = 8$

$\rho \equiv \leq$