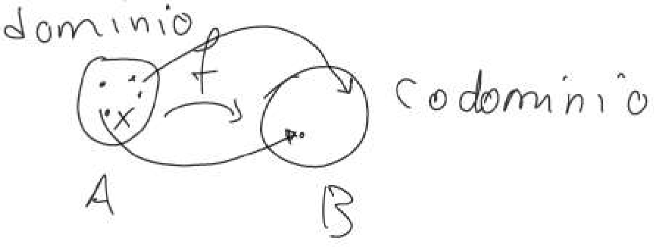
FUNZIONI



$f(x) = x^2 - 6$

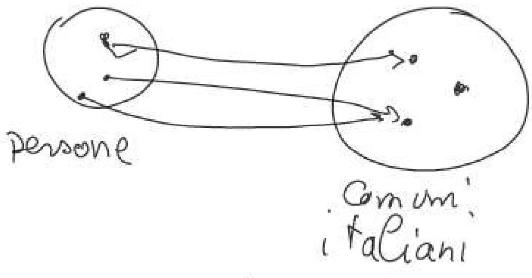
$f: \mathbb{R} \to \mathbb{R}$

non suriettiva

esempio -8

non arrivano frecce

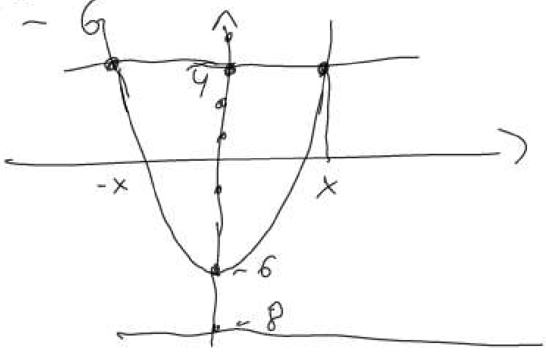
$f(2) = f(-2) = -2$

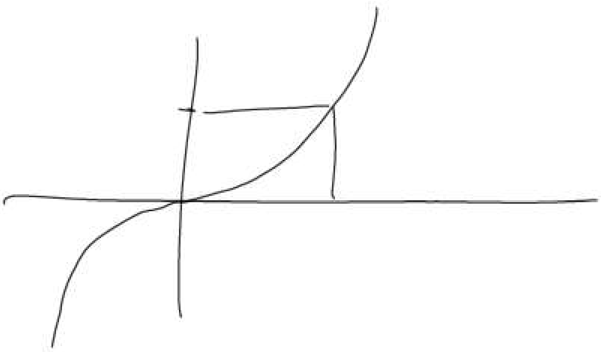


suriettività ogni elem. del codominio è l'arrivo di almeno una freccia

iniettività in ogni elem. del codominio arriva max 1 freccia.

$f(x) = x^2 - 6$ $\quad y = f(x)$

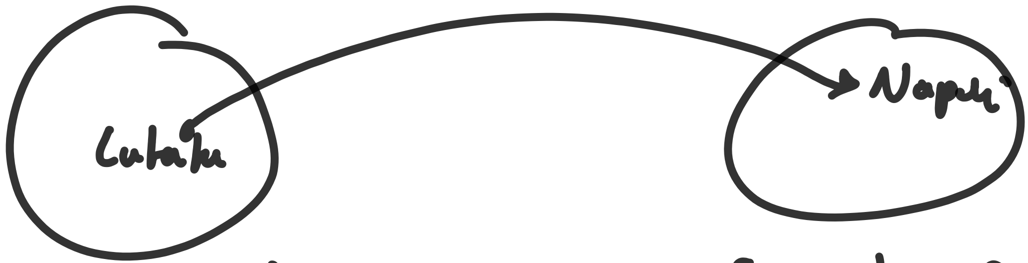




$y = x^3$

Calciatori	Squadre
Barella	Inter
Lukaku	Napoli
Lautaro	Inter
Calafiori	Fiorentina
Leao	Milan
⋮	

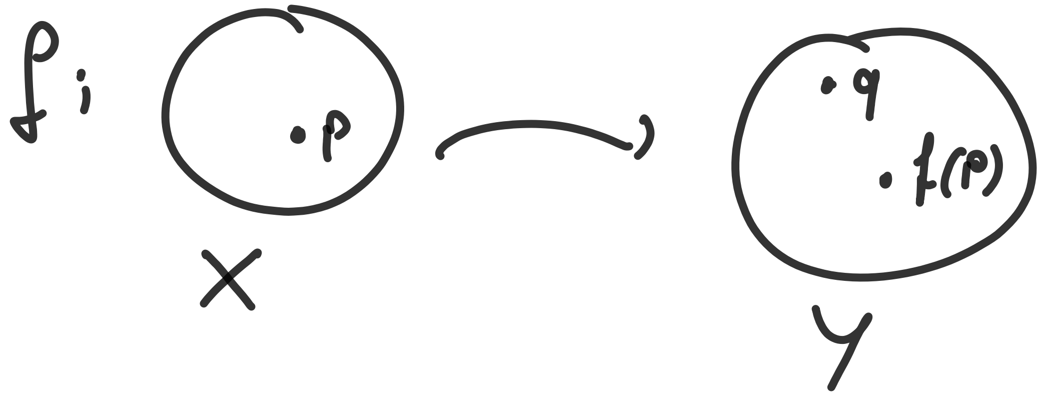
database



calciatori

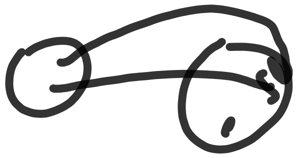
squadre serie A

	Lukaku	Leao	Calafiori	Barella	Lautaro
Napoli	X				
Inter				X	X
Milan		X			
Fiorentina			X		



$f(p)$ = immagine di p

Controimmagine



$$f^{-1}(q) = \{p : f(p) = q\}$$

$f = x^2 - 6$

$f^{-1}(3) = \{x : f(x) = 3\}$

$= \{x : x^2 - 6 = 3\}$

$= \{x : x^2 = 9\} = \{3, -3\}$

$f^{-1}(-10) = \emptyset$

f : calciatore $\Rightarrow$ squadra

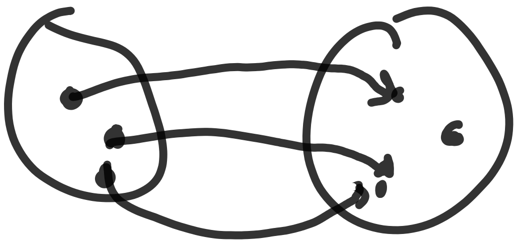
$f^{-1}(\text{Milan}) = \{$ calciatori del Milan $\}$

$f^{-1}(q) =$
- $\emptyset$ se in q non arrivano frecce
- $\{p\}$ se in q arriva una sola freccia
- $\{p_1, \dots, p_n\}$ se in q arrivano più frecce

f suriettiva $\Rightarrow$ $f^{-1}(q)$ non è mai $\emptyset$

f iniettiva $\Rightarrow$ $f^{-1}(q)$ al max ha un elem.

dominio



se $p \neq q$

$f^{-1}(p) \cap f^{-1}(q) = \emptyset$

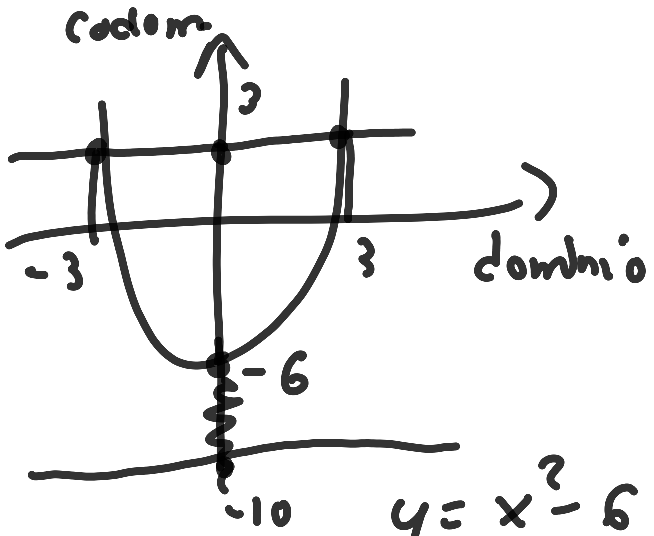
dominio = $\bigcup_{p \in \text{codominio}} f^{-1}(p)$

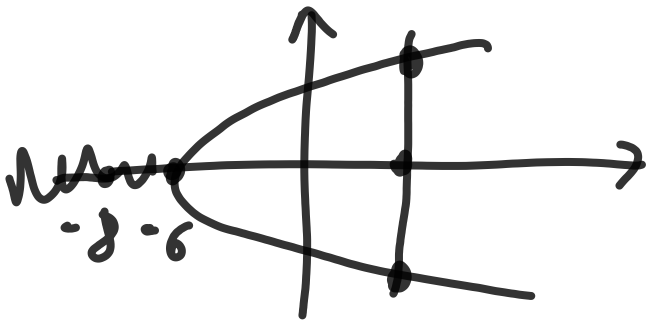
f^{-1} dà la funzione inversa

$\Updownarrow$

f è iniettiva + suriettiva

$f(x) = x^2 - 6$

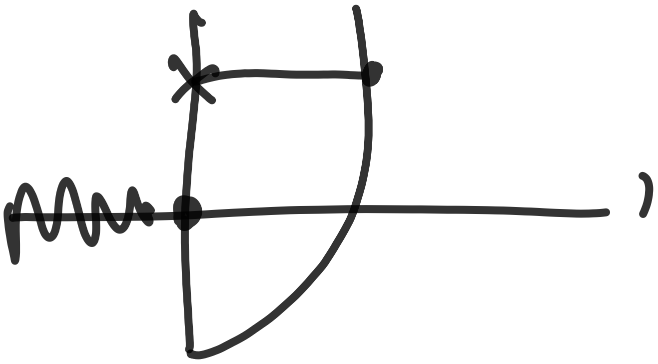




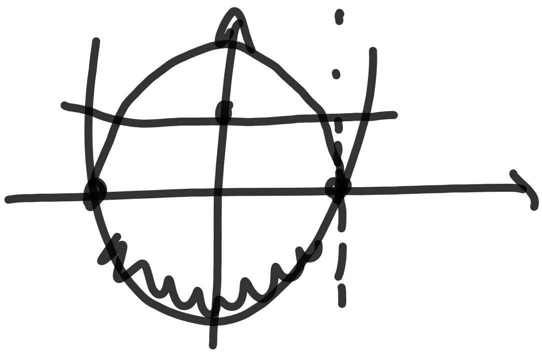
$y = x^2 - 6$

$x^2 = y + 6$

$x = \pm \sqrt{y+6}$



$f(x) = |x^2 - 6|$

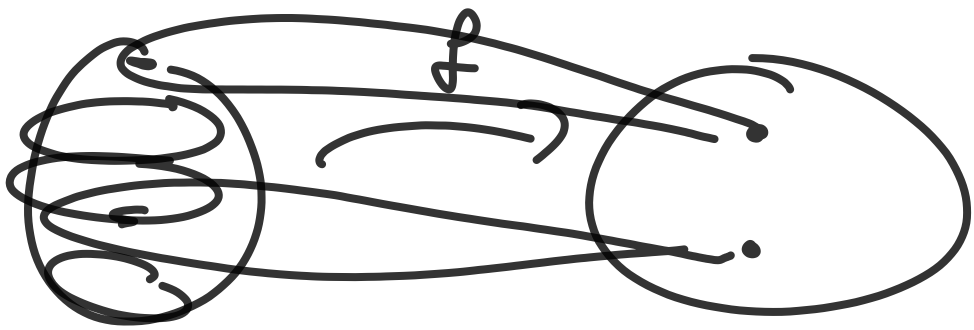


Elenco Telefonico

utenti ~~→~~ n° telefono attivati

f^{-1}(Mario Rossi) $= \{$ numeri di tel. di Mario Rossi $\}$

D



controimmagini

→ le controimmagini sono a due a due separate e coprono D

$$f(x) = x^3 \qquad f : \mathbb{R} \to \mathbb{R} \supseteq \mathbb{R}_+$$

$$x = -1 \qquad f^{-1}(-1) = \{-1\}$$

$$f^{-1}(\mathbb{R}_+) = \{ q \in \underset{\mathbb{R}}{\underset{\shortparallel}{\text{dominio}}} ; f(q) \in \mathbb{R}_+ \}$$

$$= \{ q \in \mathbb{R} : f(q) = \cancel{x}\, q^3 > 0 \} = \mathbb{R}_+$$

f : n° di telefono $\longrightarrow$ utenti

f^{-1}(giovanni) = { n° di telefono di giovanni }

f^{-1}({ utenti che abitano in Via Garibaldi }) = ...

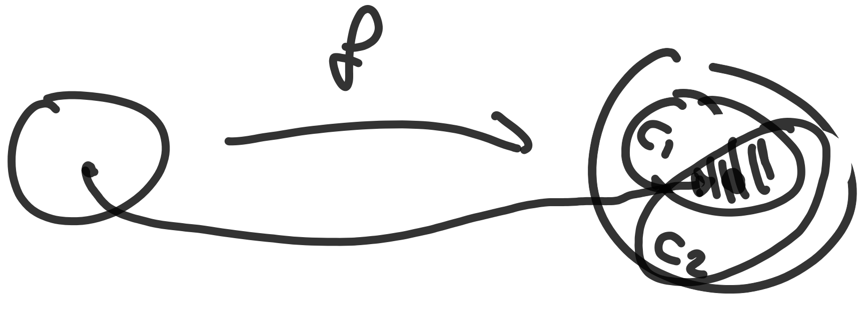
Esercizio Codominio = C

$$C_1, C_2 \subseteq C \qquad C_1 \cap C_2 = \emptyset$$

$$\Longrightarrow \quad f^{-1}(C_1) \cap f^{-1}(C_2) = \emptyset$$

$\Longleftarrow$? NO

$$f^{-1}(C_1) \cap f^{-1}(C_2) = \emptyset \Rightarrow$$



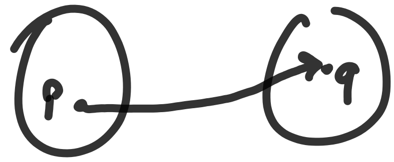
$$\forall q \in C_1 \cap C_2 \qquad f^{-1}(q) = \emptyset$$

$$f^{-1}(C_1) \cap f^{-1}(C_2) = \emptyset \iff \forall q \in C_1 \cap C_2 \;\; f^{-1}(q) = \emptyset$$

f^{-1} funzione inversa

esiste $\iff$ $\forall q \in$ codominio $f^{-1}(q)$ è un singoletto $= \{p\}$

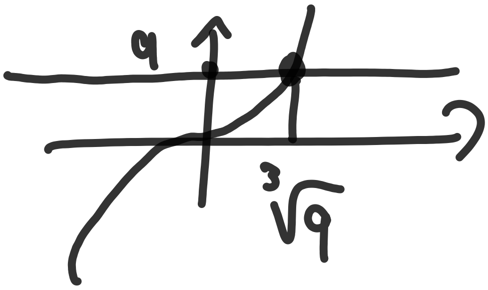
Si definisce $p = f^{-1}(q)$



$\forall q$ $\exists$ una e una sola freccia che arriva in q

<u>Ex</u> $f(x) = x^3$ $\quad f: \mathbb{R} \to \mathbb{R}$

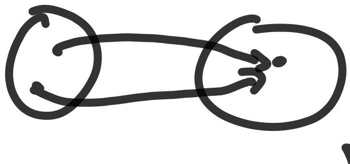
è invertibile $\quad f^{-1}(y) = \sqrt[3]{y}$



Quando esistono q tali che $f^{-1}(q)$ ha <u>0 elem.</u> o <u>più di un elem.</u>

$\Downarrow$

restringere il codominio

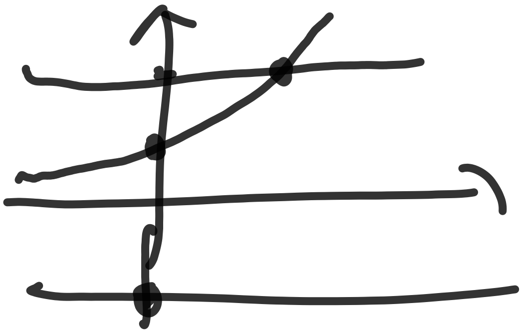


$\Downarrow$

restringere il dominio

$f(x) = e^x$

per avere f^{-1} restringo il codom. a $\mathbb{R}_+$ $\quad \ln: \mathbb{R}_+ \to \mathbb{R}$



$x^2 - 6$

$\cancel{\mathbb{R} \to \mathbb{R}}$

$\Downarrow$

$\mathbb{R}_+ \cup \{0\} \leftarrow \{x : x \geq -6\}$

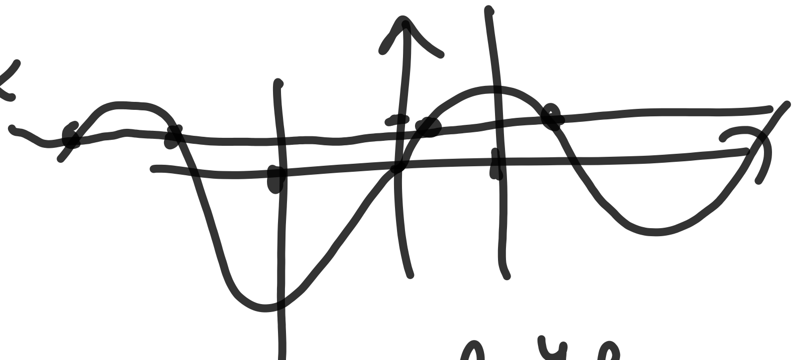
f^{-1} $\quad$ $= C$

$y = x^2 - 6 \qquad x = \sqrt{y+6}$

f(calciatore) = sua squadra

f^{-1}(squadre) = calciatore capitano

$f(x) = \text{sen}\, x$

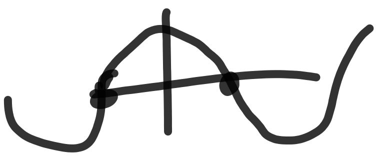


$\text{sen}^{-1}(2) = \emptyset$

↳ $-1 \leq x \leq 1$

$\text{arcsen}(x) = \dfrac{\text{valore } y \text{ fra } -\pi/2 \text{ e } \pi/2}{\text{tale che } \text{sen}\, y = x}$

arccos $\quad -1 \leq x \leq 1$



$\arccos(x) = \dfrac{\text{valore } y \text{ fra } 0 \text{ e } \pi \text{ t.c.}}{\cos y = x}$

$f(x) = \begin{cases} 1 & \text{se } x \in \mathbb{Q} \\ -1 & \text{se } x \notin \mathbb{Q} \end{cases} \qquad f^{-1}\ ?$