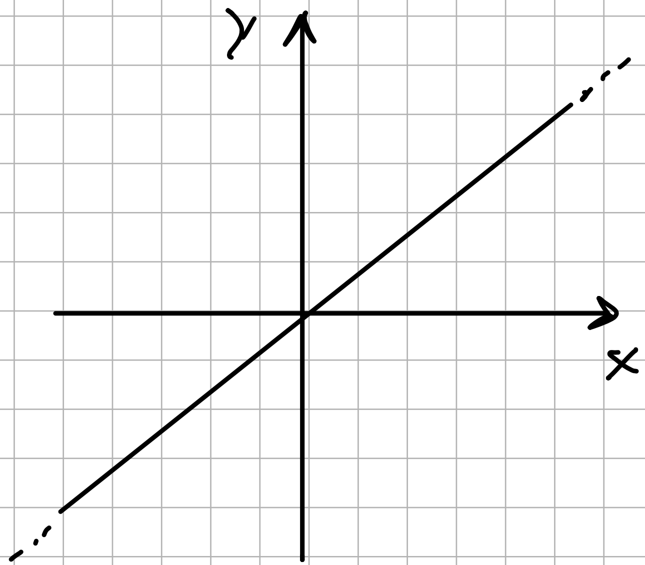
ESERCIZIO 1

1) $f(x) = x$

a) $Dom(f) = \mathbb{R}$ NON HO LIMITAZIONI

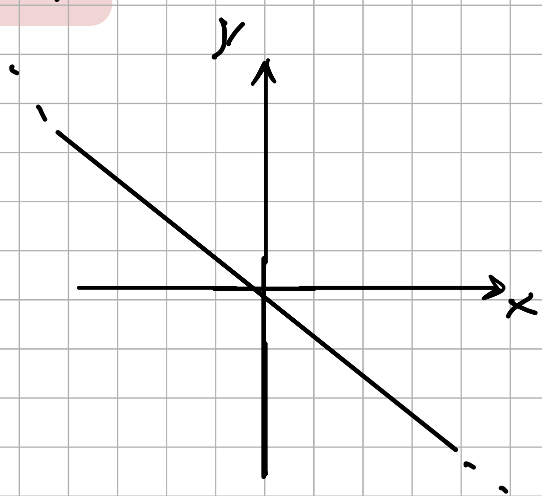
b)



$\nexists$ MAX, $\nexists$ min, $\sup(f) = +\infty$, $\inf(f) = -\infty$

c) BIGETTIVA

2) $g(x) = -x$



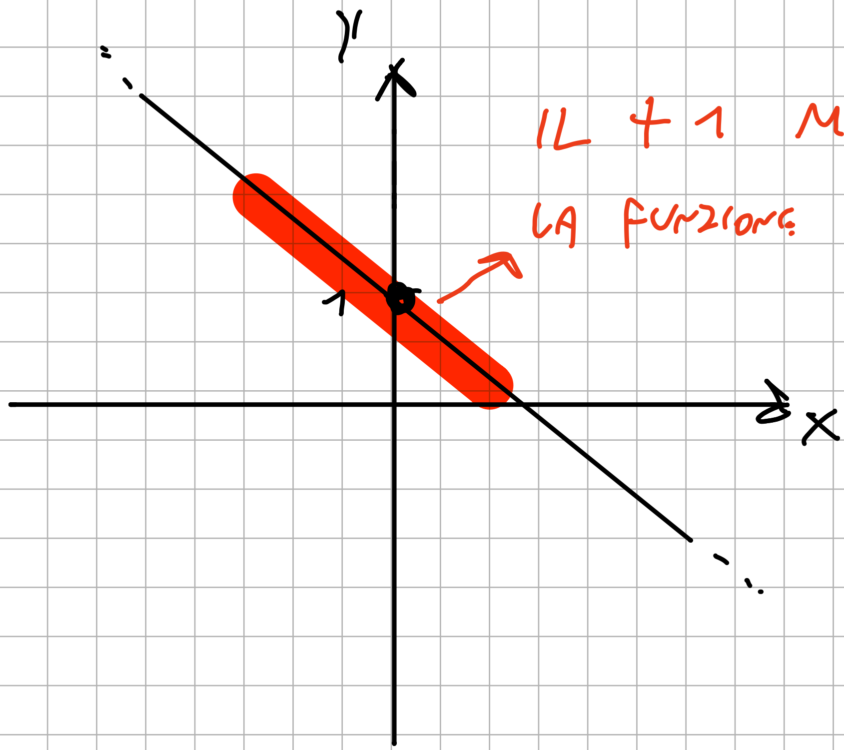
a) $DOM(g) = \mathbb{R}$

B E C UGUALI ALLA 1

3) $H(x) = -x+1$

a) $DOM = \mathbb{R}$

b)



$\nexists$ MAX, $\nexists$ min, $SUP(H) = +\infty$, $INF(H) = -\infty$

c) INIETTIVA: $f(a) = f(b)$

$-a+1 = -b+1 \Rightarrow -a = -b \Rightarrow \boxed{a=b}$

SURIETTIVITA': $y = -x + 1$

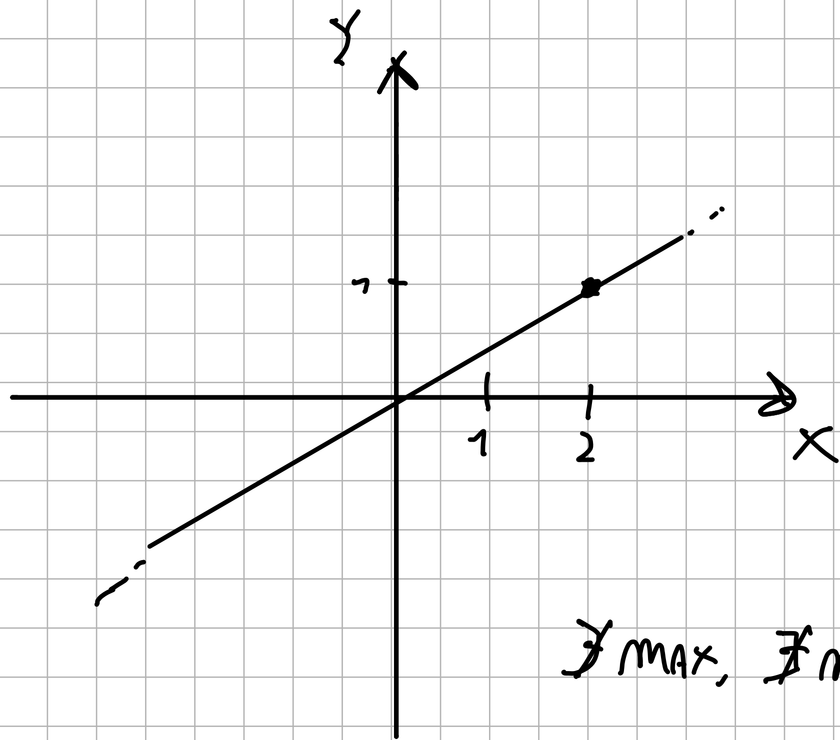
$$\boxed{x = -y + 1}$$

LA FUNZIONE È BIGETTIVA

4) $i(x) = \frac{1}{2} x$

a) $\mathrm{Dom}(i) = \mathbb{R}$

b)



x	y
0	0
1	1/2
2	1

$\nexists$ max, $\nexists$ min, sup$(+\infty)$, inf$(-\infty)$

c) INIETTIVITA':

$f(a) = f(b)$

$\frac{1}{2} a = \frac{1}{2} b \Rightarrow a = b$ ✓

SURIETTIVITA': $y = \frac{1}{2}x \Rightarrow -x = -y \cdot \frac{1}{2} \Rightarrow$

$x = y \cdot \frac{1}{2}$ ✓

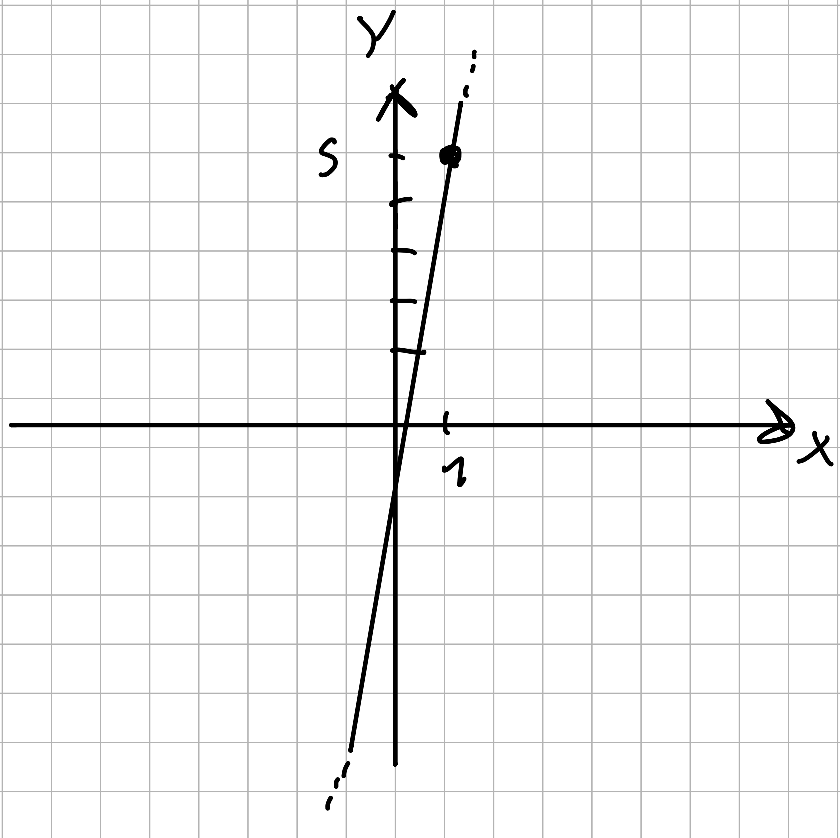
BIETTIVA

5) $f(x) = 5x$

a) $DOM = \mathbb{R}$

b)

x	y
0	0
1	5



QUANDO HO UN NUMERO CHE MOLTIPLICA LA X

IL GRAFICO SI RESTRINGE VERSO SINISTRA

$\nexists$ MAX, $\nexists$ min, SUP $= +\infty$, INF$(-\infty)$

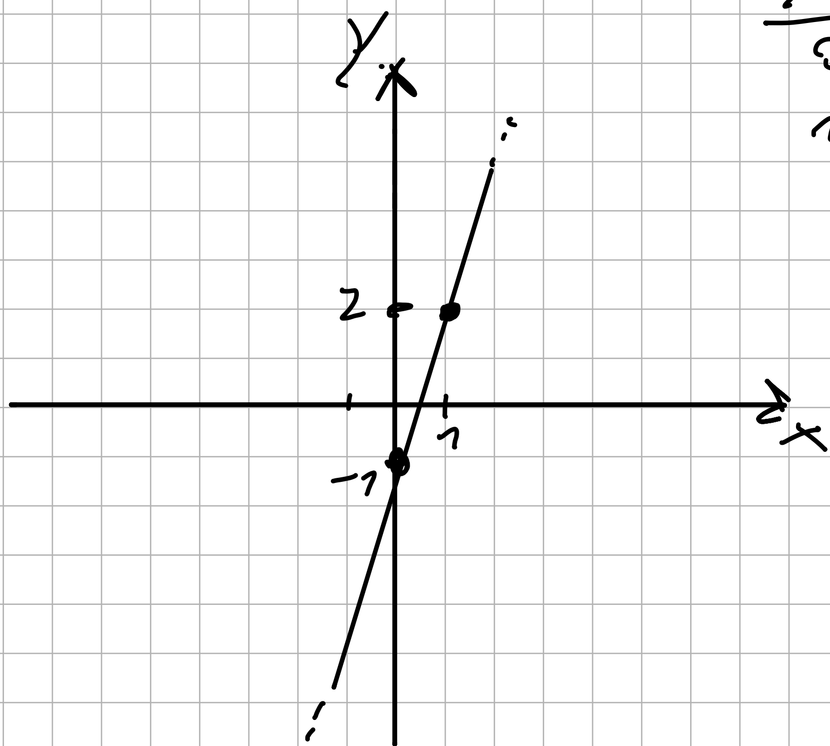
c) BIGETTIVA

6) $f(x) = 3x - 1$

a) DOM $= \mathbb{R}$

b)

X	Y
0	-1
1	2



$\nexists$ MAX, $\nexists$ min, SUP $= +\infty$, INF $= -\infty$

c) INIETTIVA: $f(a) = f(b)$

$3a - 1 = 3b - 1 \Rightarrow a = b$ V

SURIETTIVA: $y = 3x - 1$

$-3x = -y - 1 \Rightarrow 3x = y - 1 \Rightarrow$

$x = \frac{y-1}{3}$ ✓

ESERCIZIO 2

$R(x) = ax + b$

LA FUNZIONE RAPPRESENTA UNA RETTA DI PENDENZA a CHE INTERSECA L'ASSE y NEL PUNTO (a, b).

IL $+b$ MI SPOSTA IN "ALTO" LA FUNZIONE SE DOVESSIMO AVERE b CON VALORE 1 IL PUNTO DI ORIGINE DELLA FUNZIONE SARA' 1.

ESSENDO UNA RETTA LA FUNZIONE SARA' SEMPRE SURIETTIVA E IL DOM E' $\mathbb{R}$ IN QUANTO NON HO LIMITAZIONE.

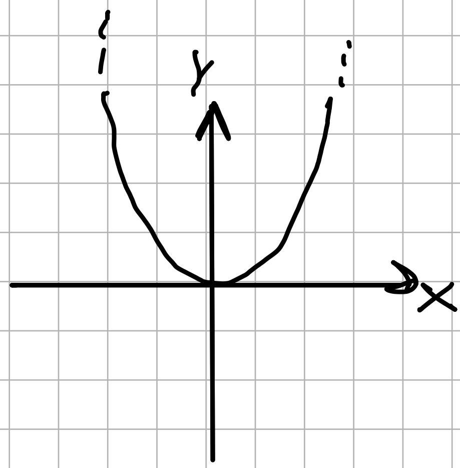
$\nexists$ max, $\nexists$ min, $\sup = +\infty$, $\inf = -\infty$.

ESERCIZIO 3

1) $f(x) = x^2$

a) DOM = $\mathbb{R}$ $\quad$ $Im(f) = [0, +\infty)$

b)



$\nexists$ MAX, SUP = $+\infty$, INF = min = 0

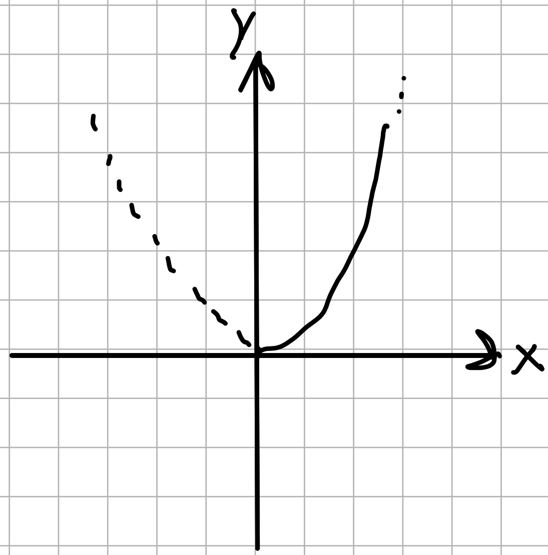
c) NON E' INIETTIVA IN QUANTO DUE VALORI DIVERSI MI DANNO LO STESSO RISULTATO:

$f(1) = 1$

$f(-1) = 1$

NON E' SURIETTIVA IN QUANTO I VALORI SOTTO L'ASSE x (I VALORI NEGATIVI) NON VENGONO MAI RAGGIUNTI.

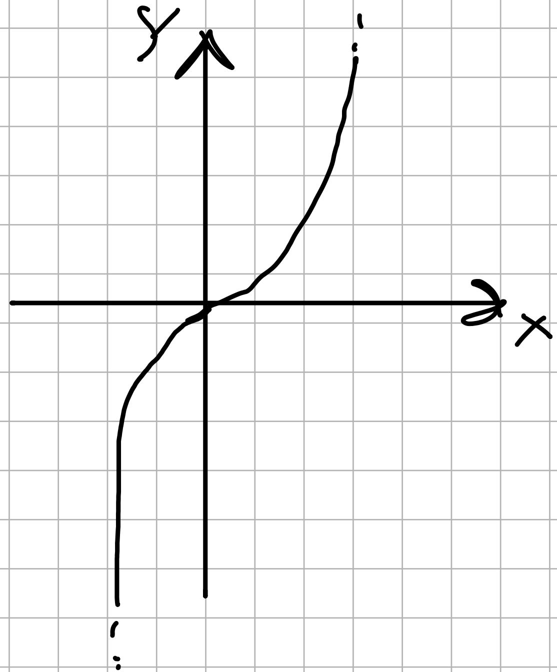
b) $f|A = [0, +\infty)$



2) $f(x) = x^3$

a) $Dom = \mathbb{R}$ $\quad$ $Im = \mathbb{R} = (-\infty, +\infty)$

b)



$\nexists$ max, $\nexists$ min,

sup $= +\infty$, inf $= -\infty$

c) INIETTIVITÀ: $f(x_1) = f(x_2) \Leftrightarrow x_1 = x_2$

$\Rightarrow x_1^3 = x_2^3 \Rightarrow \sqrt[3]{x_1^3} = \sqrt[3]{x_2^3} \Rightarrow x_1 = x_2$

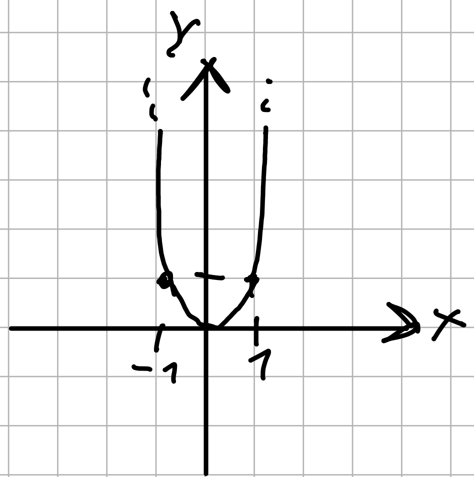
E' SURIETTIVA, LO SI VEDE DALL'IMMAGINE.

D) LA FUNZIONE E' GIA' INIETTIVA

3) $f(x) = x^4$

a) $Dom = \mathbb{R}$ $\qquad Im = [0, +\infty)$

b)



X	Y
-1	1
1	1

$\nexists$ max, min = INF = 0, SUP = $+\infty$

C E D UGUALI ALLA 1

4) x^5 PROCEDENDO UGUALE ALLA 2

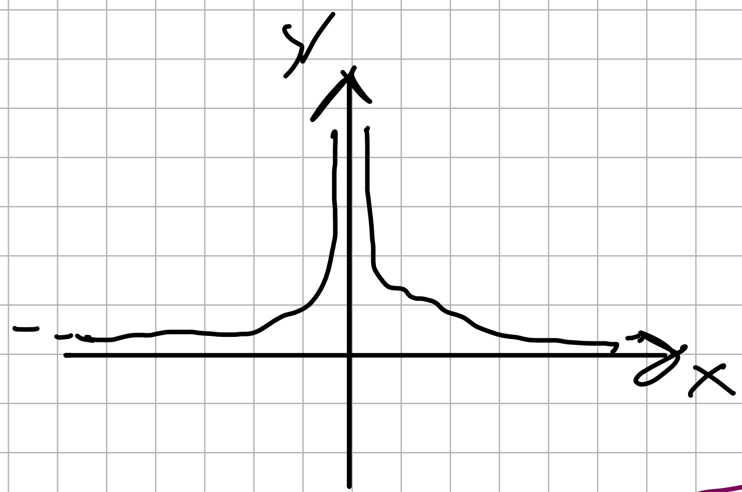
5) x^{-2}

a) LA FUNZIONE x^{-2} LA POSSO SCRIVERE COME

$\frac{1}{x^2}$ QUINDI DOM $= \mathbb{R}\setminus\{0\}$

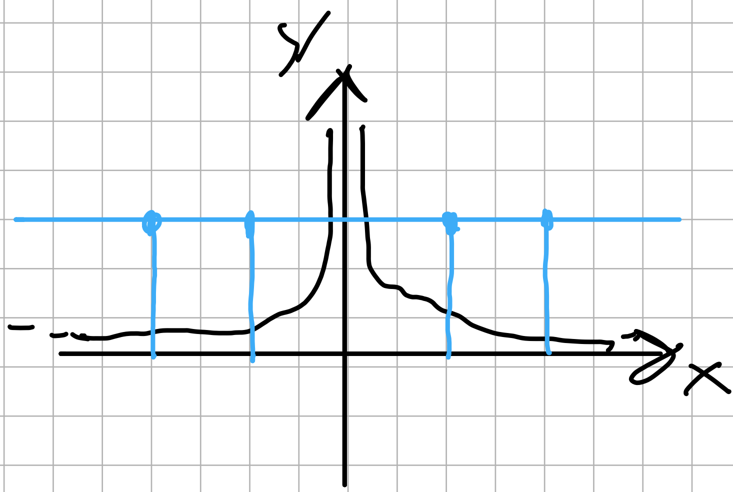
$Im = (0, +\infty)$

b)



$\nexists$ MAX, $\nexists$ min, SUP $= +\infty$, INF $= 0$ O

PERCHE' ANDANDO SEMPRE PIU' AVANTI LA FUNZIONE SI AVVICINA A 0 c)



NON È INIETTIVA: $f(1) = f(-1)$

NON SURIETTIVA, I VALORI NEGATIVI NON VENGONO PRESI.

D) $f|_A = (0, +\infty)$

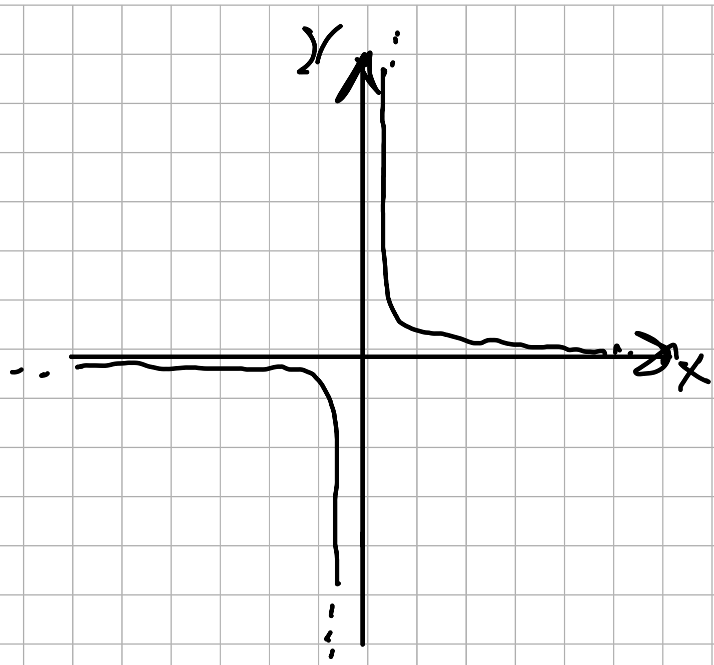
6) $f(x) = x^{-3}$

$\frac{1}{x^3}$

a) $Dom = \mathbb{R} \setminus \{0\}$

$Im = \mathbb{R} \setminus \{0\}$

b)



$\nexists$ MAX, $\nexists$ min, SUP $= +\infty$, INF $= -\infty$

c) INIETTIVITA': $\dfrac{1}{x_1^3} = \dfrac{1}{x_2^3} \Rightarrow x_1^3 = x_2^3$

$\Rightarrow \sqrt[3]{x_1^3} = \sqrt[3]{x_2^3} \Rightarrow x_1 = x_2$ V

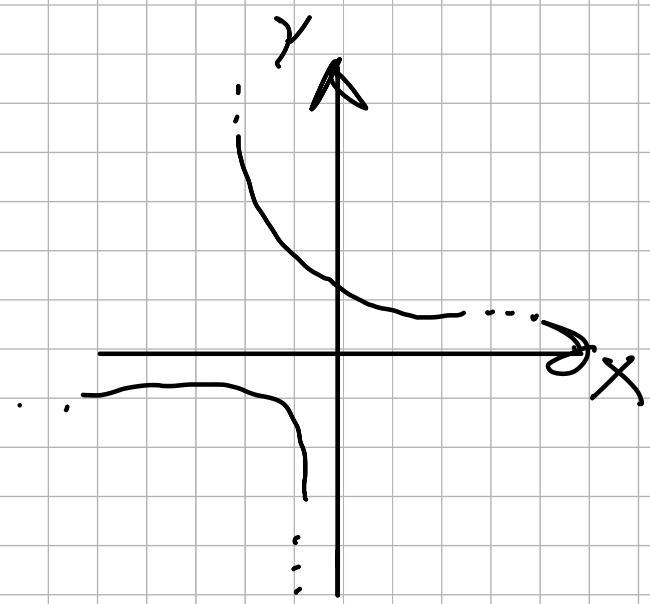
SURIETTIVA NO PERCHE TOLGO LO 0

d) GIA' INIETTIVA

7) $f(x) = \dfrac{1}{1+x}$

a) $Dom = \mathbb{R} \setminus \{-1\}$ $Im = \mathbb{R} \setminus \{-1\}$

b)



$\nexists$ MAX, $\nexists$ min, SUP $= +\infty$, INF $= -\infty$

c) $\frac{1}{1+x_1} = \frac{1}{1+x_2} \Longrightarrow 1+x_1 = 1+x_2 \Rightarrow$

$x_1 = x_2$ V

SURIETTIVA NO

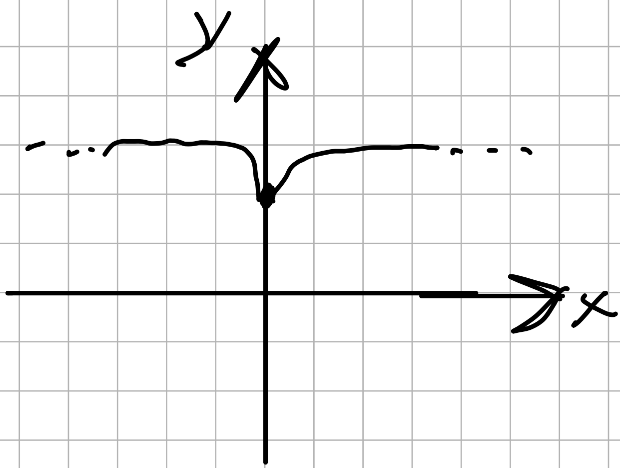
D) GIA' INIETTIVA

8) $1 - \dfrac{2}{2+x^2}$

a) $\mathrm{Dom} = \mathbb{R}$ $\qquad$ $\mathrm{Im} = (0, +\infty)$

x GUARDARE SU DESMOS

b)



$\min: 1/2$, $\nexists$ MAX, $\sup(f) = 1$, $\mathrm{INF} = 1/2$

c) INIETTIVA NO PERCHÉ $f(1) = f(-1)$

NO SURIETTIVA

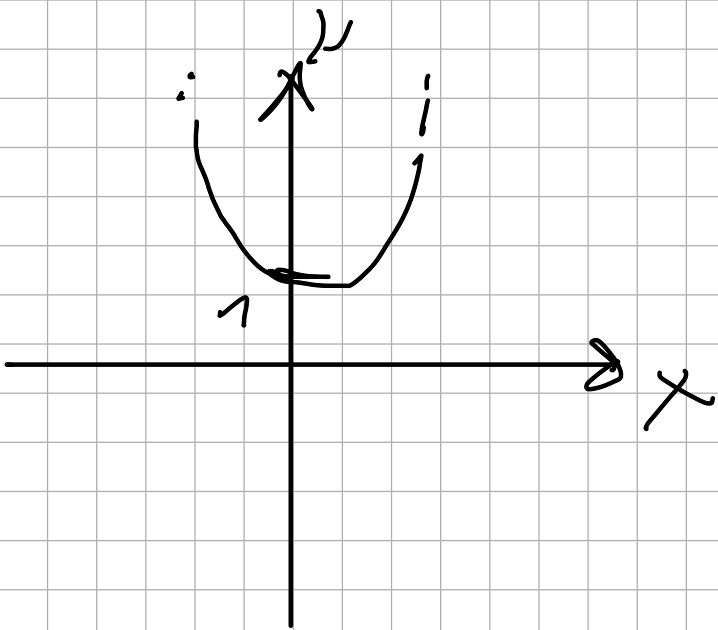
d) $f(A) = [1, +\infty)$

ESERCIZIO 4

1) x^2+1

a) $Dom = \mathbb{R}$

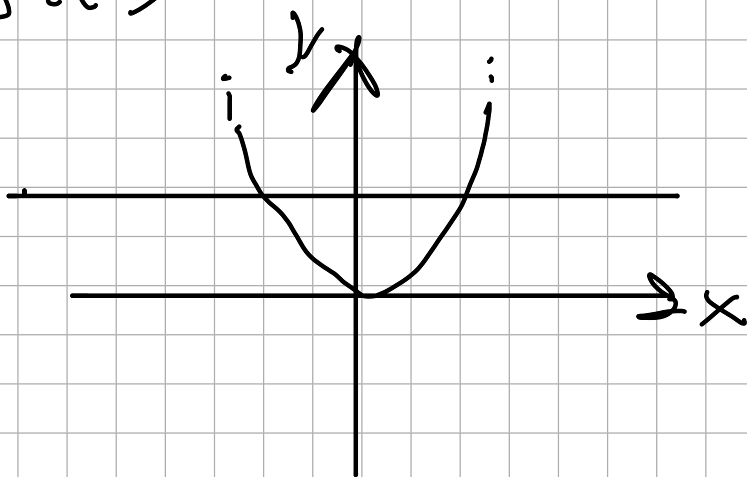
b)



$\min = \inf = 1$, $\nexists$ MAX, $\sup = +\infty$

c) NO INIETTIVA NO SURIETTIVA

d) $g_1(x) = 1$ $\quad g_2(x) = x^2$

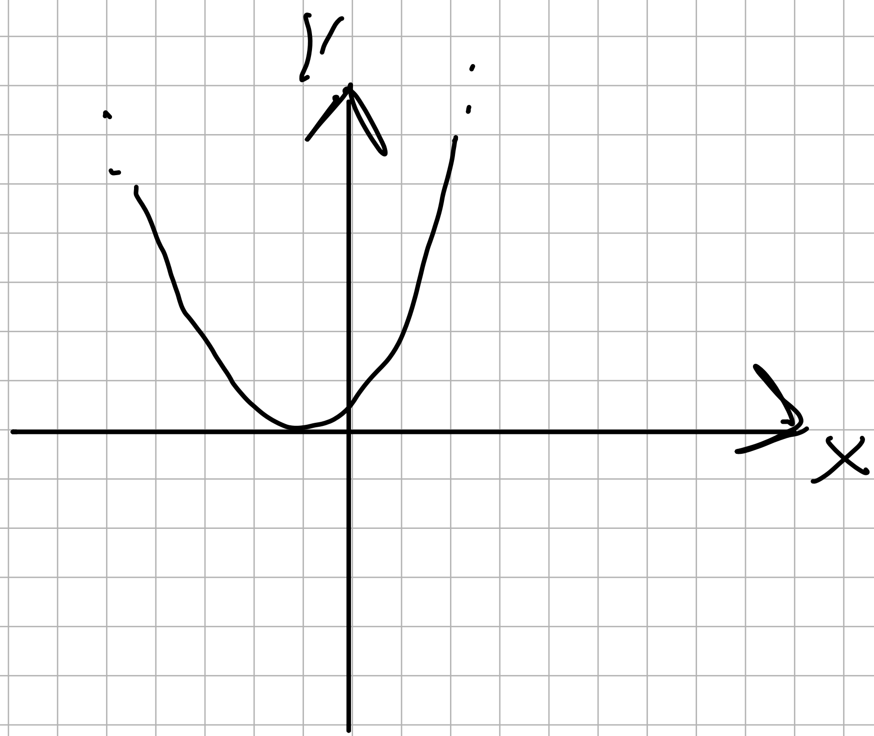


$g_1 + g_2 = f(x)$

2) $(x+1)^2$

a) Dom = $\mathbb{R}$ $\qquad$ Im = $[0, +\infty)$

b)



$\nexists$ MAX, SUP = $+\infty$, INF = min = -1

c) NO INIETTIVA IN QUANTO $f(0) = f(-2)$

NON SURIETTIVA

d)

$g_1(x) = x+1$ $g_2(x) = x^2$

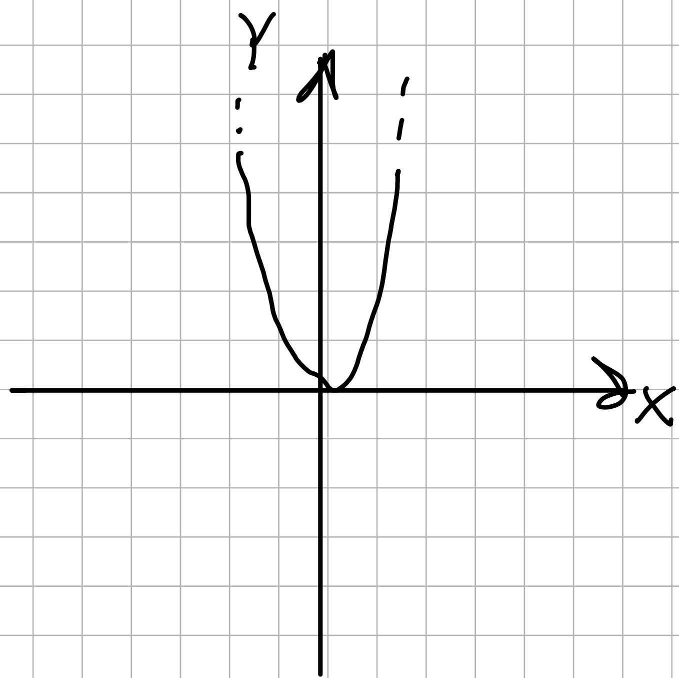
$g_2(g_1(x)) = g_2(x+1) = (x+1)^2 =$

$= \varphi(x)$

3) $4x^2$

a) $Dom = \mathbb{R}$

b)



$\min = 0 = \inf$, $\sup = +\infty$, $\nexists \max$

c) NO INIETTIVA / NO SURIETTIVA

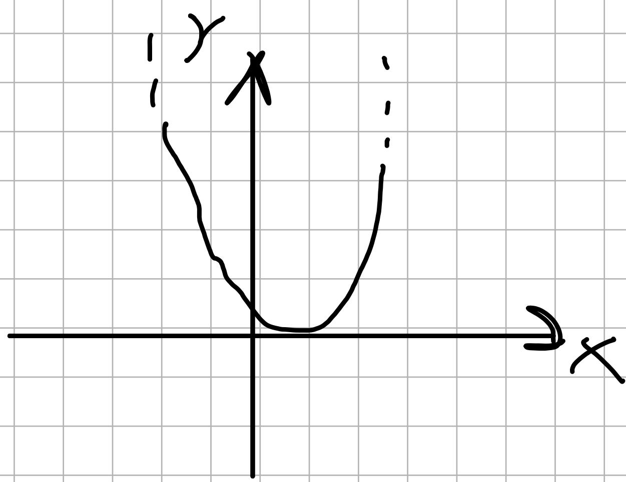
D) $g_1(x) = x^2$ $\quad g_2(x) = 4$

$g_1(x) \cdot g_2(x) = f(x)$

4) $(3x-1)^2$

a) Dom $= \mathbb{R}$

b)



SUP $= +\infty$, $\nexists$ MAX, min $=$ INF $= 0{,}33$

c) NO SURIETTIVA, NO INIETTIVA.

D) $g_1(x) = 3x-1$ $\quad g_2(x) = 3x-1$

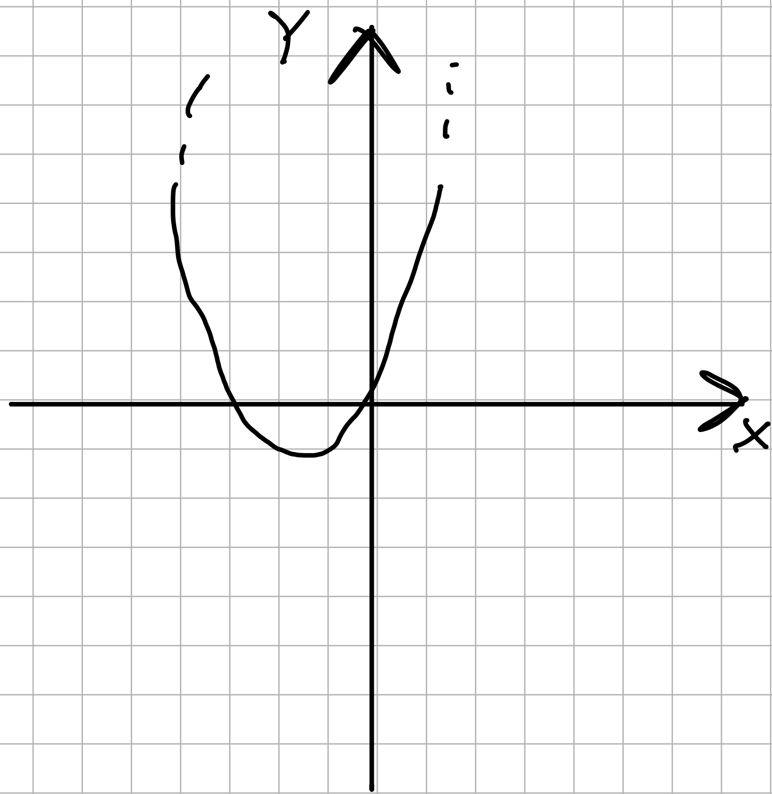
$g_1(x) \cdot g_2(x) = f(x)$

ESERCIZIO 5

1) $f(x) = x^2 + x$

$DOM = \mathbb{R}$

b)



$\nexists$ MAX, SUP $= +\infty$, INF $=$ min $= -0{,}5$

c) NO INIETTIVA NO SURIETTIVA

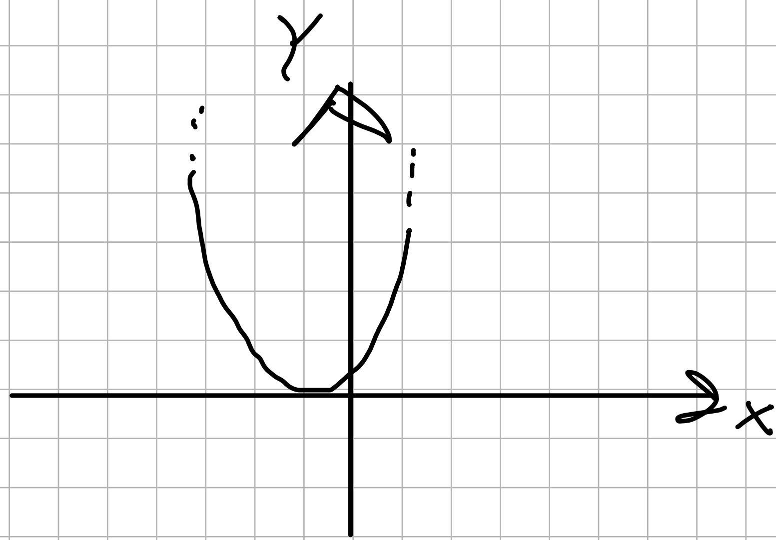
D) $g1(x) = x^2 + x$ $g2(x) = 1$

$g1 \cdot g2 = f(x)$

2) $(2x+1)^2$

a) $Dom = \mathbb{R}$

b)



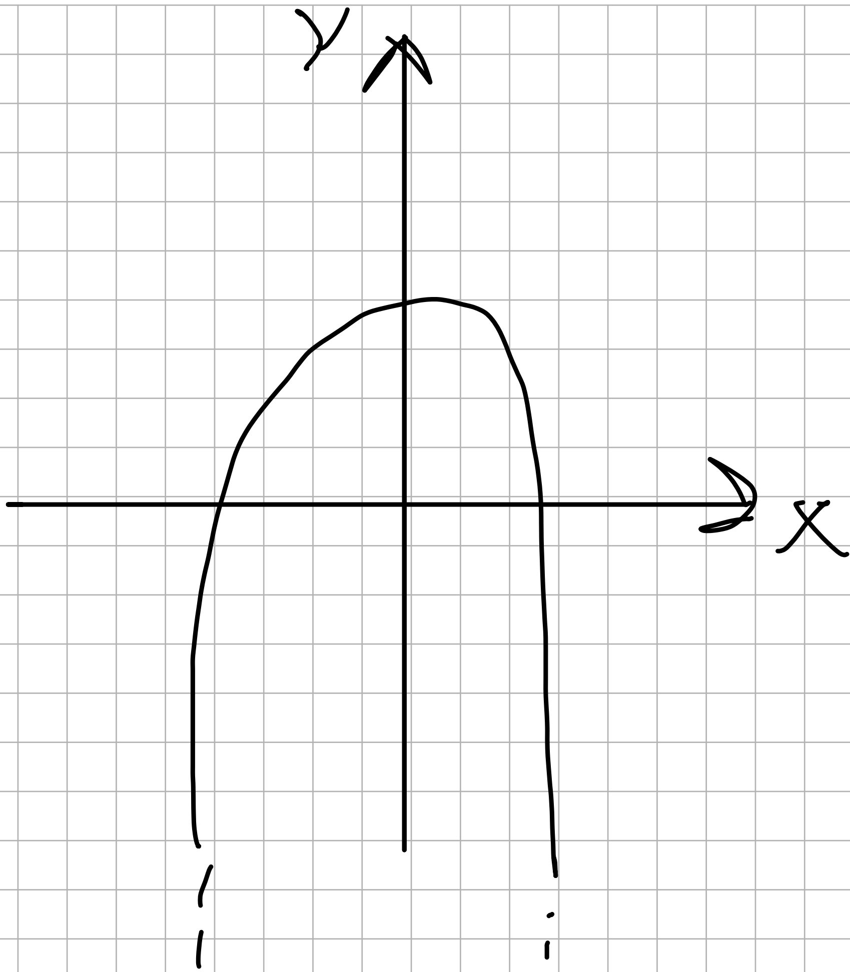
$\nexists$ MAX, SUP $= +\infty$, min $=$ INF $= -0,5$

c) NO INIETTIVA NO SURIETTIVA

3) $1 - x^2$

a) $Dom = \mathbb{R}$

b)



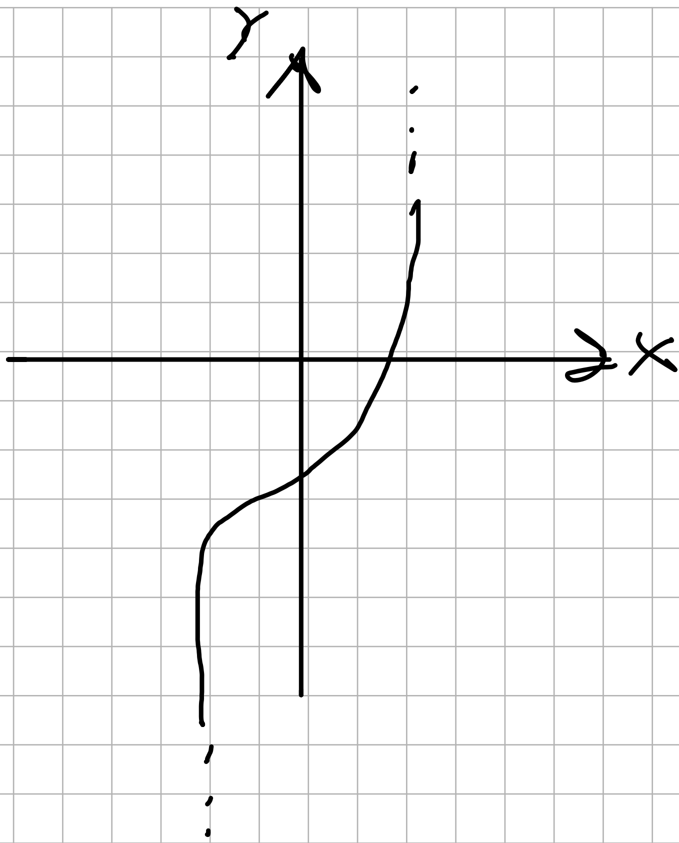
MAX = SUP = 1 $\nexists$ min INF = $-\infty$

c) NO INIETTIVA NO SURIETTIVA

4) $(x-1)^3$

a) DOM = $\mathbb{R}$

b)



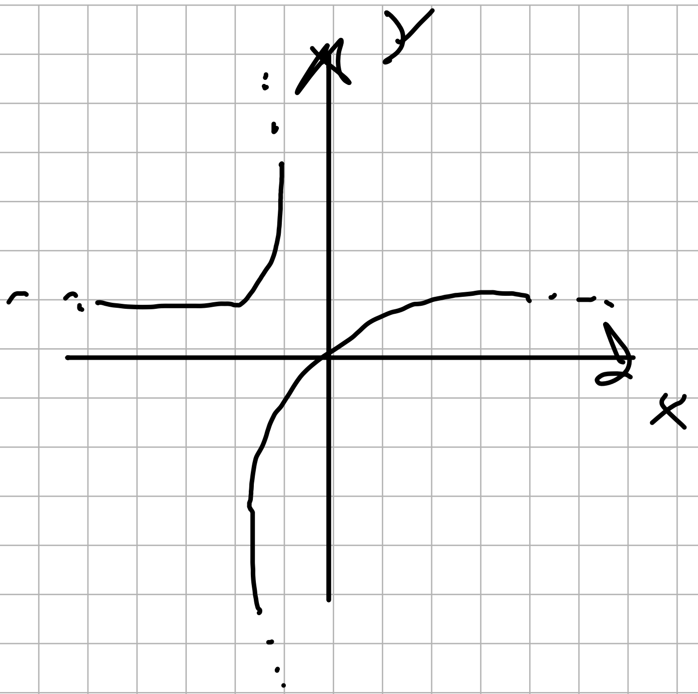
$\nexists$ MAX, $\nexists$ min, SUP $= +\infty$, INF $= -\infty$

c) SURIETTIVA SI   INIETTIVA SI

$$(x_1 - 1)^3 = (x_2 - 1)^3 \Longrightarrow \boxed{x_1 = x_2}$$

5) $\dfrac{x}{x+3}$ DOM: $\mathbb{R} \setminus \{-3\}$

b)



$\nexists$ MAX, $\nexists$ min, SUP$(+\infty)$, INF$(-\infty)$

c) NON SURIETTIVA

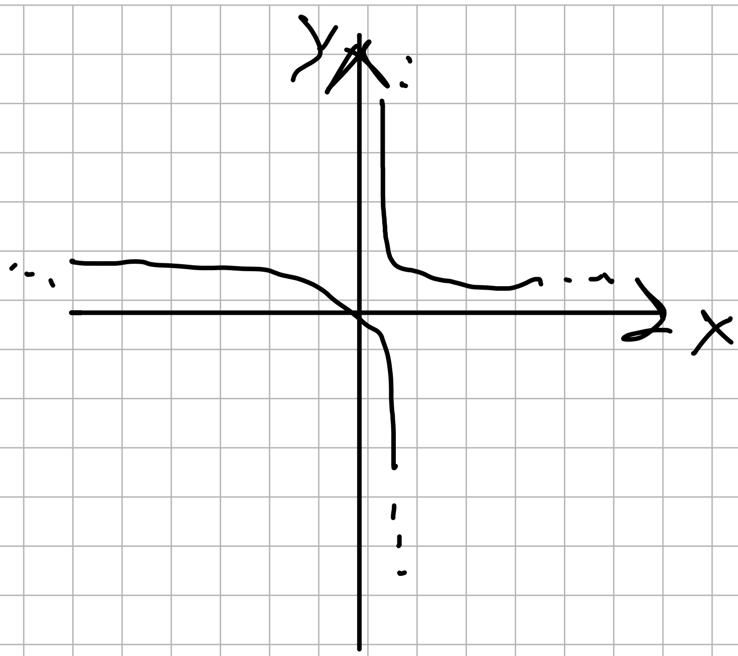
$$\frac{a}{a+3} = \frac{b}{b+3} \Rightarrow a(b+3) = b(a+3) \Rightarrow$$

$$\Rightarrow ab + 3a = ab + 3b \Rightarrow 3a = 3b \Rightarrow$$

$$\boxed{a = b}$$ ✓

6) $\dfrac{x+1}{x-1}$ Dom $= \mathbb{R} \setminus \{1\}$

b)



$\nexists$ max, $\nexists$ min, sup $= +\infty$, inf $= -\infty$

c) NON SURIETTIVA

$$\frac{a+1}{a-1} = \frac{b+1}{b-1} \Rightarrow$$

$$\Rightarrow (a+1)\cdot(b-1) = (b+1)\cdot(a-1) \Rightarrow$$

$$ab - a + b - 1 = ab - b + a - 1 \Rightarrow$$

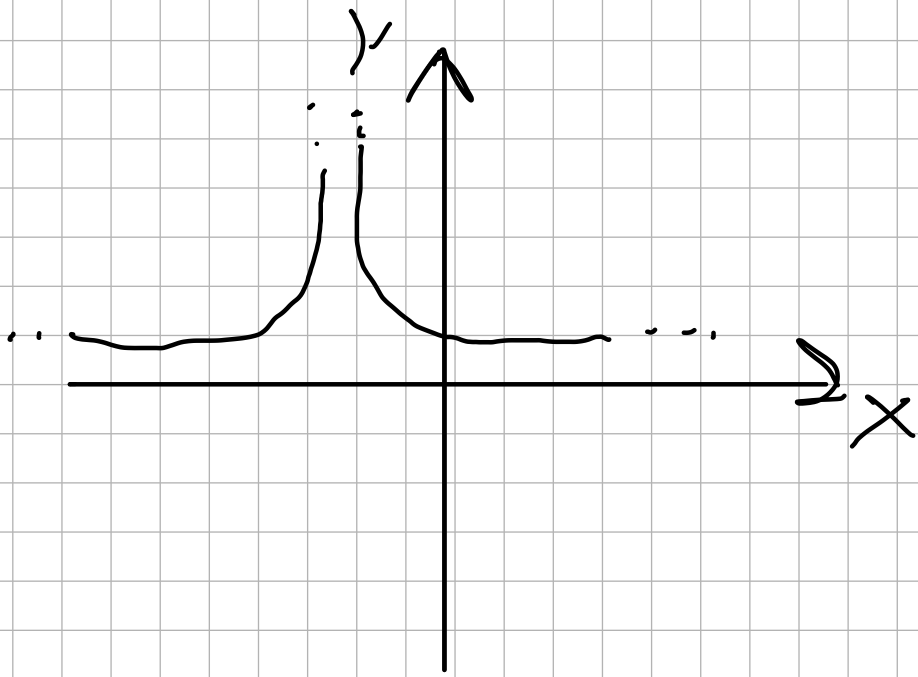
$$-a + b = -b + a \Rightarrow 2b = 2a \Rightarrow \boxed{b = a}$$

V

7) $\frac{1}{(x+1)^2}$

a) Dom \ $\{-1\}$

b)



$\nexists$ max, $\nexists$ min, sup $= (+\infty)$ = inf $= 0$

c) NON SURIETTIVA   NO INIETTIVA