scala loglog base 10

$y(x) = 2x^{-2}$

$$\begin{cases} w = \log x \\ z = \log y \end{cases}$$

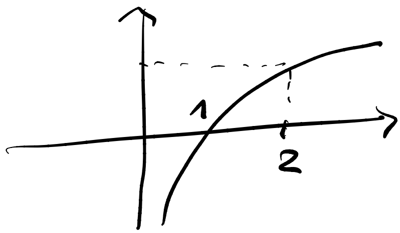
$$z = \log y = \log(2x^{-2}) = \log 2 + \log(x^{-2})$$

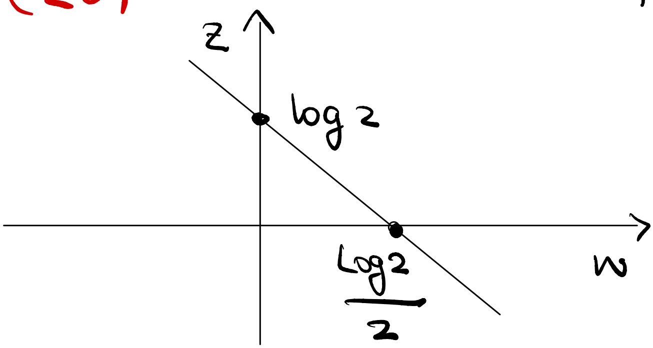
$$z = \log 2 - 2\underbrace{\log x}_{w}$$

$$z = -2w + \underbrace{\log 2}_{\text{intercetta}} > 0$$

coeff. angolare

(<0)





$z = 0 \Rightarrow w = \log 2 / 2$

semilogy (base 10)

$$\begin{cases} W = x \\ z = \log y \end{cases}$$

$z = 2W - 2$

$\downarrow$

$\log y = 2x - 2$

$10^{\log y} = 10^{2x-2}$

$y = 10^{2x-2} = 10^{2x} \cdot 10^{-2}$

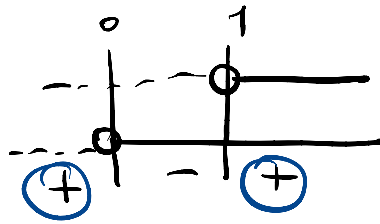
$y = 10^{-2} \cdot 10^{2x}$

$$e^{\frac{x-1}{2x}} \ln\left(\frac{x-1}{2x}\right) \geq 0$$

C.E. $\begin{cases} x \neq 0 \\ \dfrac{x-1}{2x} > 0 \end{cases}$

$\dfrac{x-1}{2x} > 0$ N>0: $x>1$

D>0: $x>0$



$$\boxed{x<0 \cup x>1}$$

$$\underbrace{e^{\frac{x-1}{2x}}}_{>0} \ln\left(\frac{x-1}{2x}\right) \geq 0$$

$$\ln\left(\frac{x-1}{2x}\right) \geq \underbrace{0}_{\ln 1}$$

$$\frac{x-1}{2x} \geq 1$$

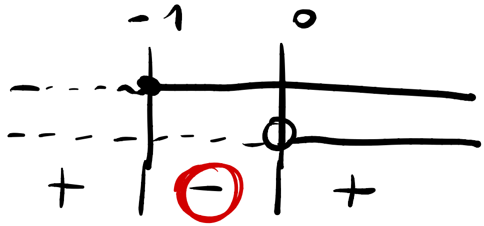
$$\frac{x-1}{2x} - 1 \geq 0$$

$$\frac{x-1-2x}{2x} \geq 0$$

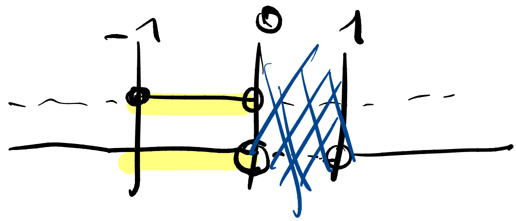
$\frac{-x-1}{2x} \geq 0 \qquad \frac{x+1}{2x} \leq 0$

$N \geq 0: \quad x \geq -1$

$D > 0: \quad x > 0$



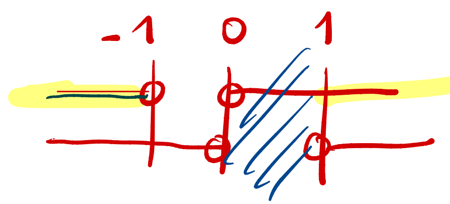
$$\begin{cases} -1 \leq x < 0 \\ x < 0 \cup x > 1 \end{cases}$$



Soluzione: $\boxed{-1 \leq x < 0}$

Sappiamo che $e^{x-1/2x} \ln\left(\frac{x-1}{2x}\right) \geq 0$

se e solo se $-1 \leq x < 0$



$$\Rightarrow \quad e^{\frac{x-1}{2x}} \ln\left(\frac{x-1}{2x}\right) \leq 0$$

$\Rightarrow \begin{cases} x \leq -1 \cup x > 0 \\ x < 0 \cup x > 1 \end{cases}$ C.E. $\Rightarrow x \leq -1 \cup x > 1$

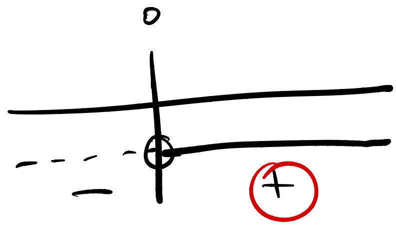
($f(x) \geq 0$ se $x > 3 \Longrightarrow$

? $f(x) < 0$ se $x < 3$)

$$e^{x-1} \cdot x^3 > 0 \qquad \text{C.E. } \mathbb{R}$$

$$e^{x-1} > 0 \quad \forall x \in \mathbb{R}$$

$$x^3 > 0 \qquad x > 0$$



$f(x) = x^2+1, \quad g(x) = \sin x$

$h(x) = (f \circ g)(x) = f(g(x)) = f(\sin x)$

$h(x) = (\sin x)^2 + 1$

$p_2(x) = h(x_0) + h'(x_0)(x-x_0) + \frac{h''(x_0)}{2}(x-x_0)^2$

$x_0 = 0$

$p_2(x) = h(0) + h'(0)\,x + \frac{h''(0)}{2}x^2$

$h(x) = (\sin x)^2+1, \quad h(0) = (\sin(0))^2 + 1 = 1$

$h'(x) = 2\sin x \cos x, \quad h'(0) = 0$

$h''(x) = 2(\cos^2 x + \sin x(-\sin x))$

$h''(0) = 2(1+0) = 2$

$p_2(x) = 1 + x^2$

$C_0 = \frac{1}{2} T_0 ,\qquad C_1 = C_0 = \frac{1}{2} T_0$

$$T_1 = T_0 + \frac{\overset{3}{\cancel{15}}}{\underset{20}{\cancel{100}}} T_0 = \frac{23}{20} T_0$$

x percentuale dei criceti rispetto ai topi dopo un anno:

$$\frac{x}{100} = \frac{C_1}{T_1} = \frac{\frac{1}{2}\cancel{T_0}}{\frac{23}{20}\cancel{T_0}} = \frac{1}{\cancel{2}} \cdot \frac{\overset{10}{\cancel{20}}}{23}$$

$$\frac{x}{100} = \frac{10}{23} \qquad x = \frac{10}{23} \cdot 100 \approx 43,47\%$$

$$\begin{cases} y_p'(x) - 3y_p(x) - 3 = 0 \\ y(0) = 1 \end{cases}$$

$$y(x) = y_o(x) + y_p(x)$$

costante $\Rightarrow$

$$y_p'(x) = 0$$

$$y_p(x) \Rightarrow \quad -3y_p(x) - 3 = 0 \Rightarrow y_p = \frac{-3}{3}$$

$$y_p = -1$$

$y_o(x)$ sol. eq. omogenea associata $\Rightarrow$

$$y_o' - 3y_o = 0$$

$$y_o'(x) = 3y_o(x) \Rightarrow$$

$$y_o(x) = A e^{3x}$$

$$y(x) = A e^{3x} - 1$$

Trovo A imponendo che $y(0) = 1$

$$y(0) = A - 1 \stackrel{!}{=} 1 \Rightarrow A = 2$$

$$\boxed{y(x) = 2e^{3x} - 1} \longrightarrow$$

FARE VERIFICA!

$x+1=3 \Rightarrow x=2$

verifica: $2+1 \stackrel{?}{=} 3$ ✓

$$\begin{cases} y'(x) - 3y(x) - 3 = 0 \\ y(0) = 1 \end{cases}$$

$$y(x) = 2e^{3x} - 1$$

Verifica: 1) $y(0) \stackrel{?}{=} 1$

$y(0) = 2e^{0} - 1 = 2 - 1 = 1$ ✓

2) $y'(x) - 3y(x) - 3 \stackrel{?}{=} 0$

$$y'(x) = 2 \cdot 3e^{3x} = 6e^{3x}$$

$$\underbrace{6e^{3x}}_{y'(x)} - 3\underbrace{(2e^{3x} - 1)}_{y(x)} - 3 \stackrel{?}{=} 0$$

$$6e^{3x} - 6e^{3x} + 3 - 3 = 0$$ ✓

$$f(x) = \cos(x)\, e^{\operatorname{sen} x}$$

$$F(x) = \int_0^x f(t)\,dt = \int_0^x \underbrace{\cos(t)}_{\frac{d\,\operatorname{sen}(t)}{dt}}\, e^{\operatorname{sen}(t)}\,dt$$

$$\underbrace{\qquad\qquad}_{\underbrace{f'(t)\, e^{f(t)}}_{\frac{d}{dt}\left(e^{f(t)}\right)}}$$

con $f(t) = \operatorname{sen} t$

$$\frac{d}{dt}\left(e^{\operatorname{sen} t}\right) = e^{\operatorname{sen} t} \cos t$$

$$F(x) = \int_0^x \cos(t)\, e^{\operatorname{sen}(t)}\,dt = \int_0^x \frac{d}{dt}\, e^{\operatorname{sen} t}\,dt$$

$$= e^{\operatorname{sen} t}\Big|_0^x = e^{\operatorname{sen} x} - e^{\operatorname{sen} 0} \quad /\!/\ 0$$

$$\boxed{F(x) = e^{\operatorname{sen} x} - 1} = \int_0^{x} f(t)\,dt$$

- $\displaystyle\int_0^{1 = x} f(x)\,dx = e^{\operatorname{sen} 1} - 1$

$y(t) = y(0)\, e^{kt}$

$y(3) = y(0) + \frac{10}{100}\, y(0) = \frac{11}{10}\, y(0)$

$y(3) = y(0)\, e^{3k}$

$\cancel{y(0)}\, e^{3k} = \frac{11}{10}\, \cancel{y(0)}$, $\ln(e^{3k}) = \ln\left(\frac{11}{10}\right)$

$3k = \ln\left(\frac{11}{10}\right) \Rightarrow k = \frac{1}{3} \ln\left(\frac{11}{10}\right)$

T tale che $y(T) = y(0) + \frac{\cancel{5}^{\,1}}{\cancel{100}_{\,20}}\, y(0) = \frac{21}{20}\, y(0)$

$y(T) = y(0)\, e^{kT}$

$\cancel{y(0)}\, e^{kT} = \frac{21}{20}\, \cancel{y(0)}$, $\ln(e^{kT}) = \ln\left(\frac{21}{20}\right)$

$kT = \ln\left(\frac{21}{20}\right) \Rightarrow T = \frac{1}{k} \ln\left(\frac{21}{20}\right) \simeq 1{,}57$

noto

$$f(x) = e^{2x}\left(\frac{1-x^2}{2x+1}\right)$$

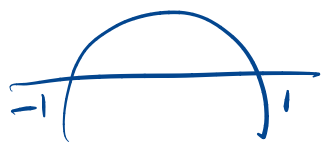
- Dominio: $x \neq -\frac{1}{2}$, $D_f = \left(-\infty, -\frac{1}{2}\right) \cup \left(-\frac{1}{2}, +\infty\right)$

- Segno: $f(x) \geq 0$

$$\underbrace{e^{2x}}_{>0}\left(\frac{1-x^2}{2x+1}\right) \geq 0$$

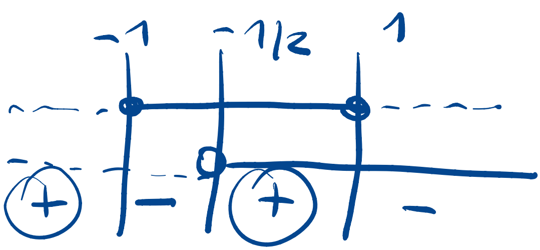
$$\frac{1-x^2}{2x+1} \geq 0$$

$N \geq 0$: $1 - x^2 \geq 0$



$-1 \leq x \leq 1$

$D > 0$: $x > -\frac{1}{2}$



- $\lim_{x \to -\frac{1}{2}^{\pm}} f(x) = \pm\infty$, $\lim_{x \to +\infty} \frac{\overset{+\infty}{e^{2x}}\,\overset{-\infty}{(1-x^2)}}{2x+1} = -\infty$ $\quad -\cancel{x^2}$ $\quad 2\cancel{x}$

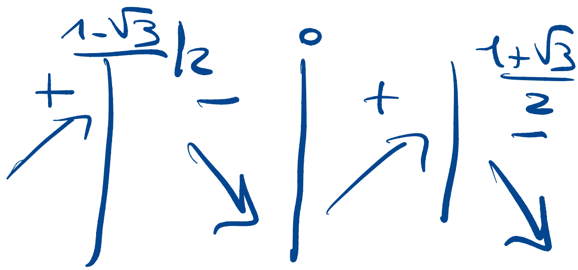
$$\lim_{x \to -\infty} \frac{\overset{\to 0}{e^{2x}}\,(1-x^2)}{2x+1} = 0 \qquad -\cancel{x^2} \qquad 2\cancel{x}$$

• derivata: $f(x) = e^{2x}\left(\frac{1-x^2}{2x+1}\right)$

$$f'(x) = 2e^{2x}\cdot\left(\frac{1-x^2}{2x+1}\right) + e^{2x}\,\frac{-2x(2x+1)-(1-x^2)\,2}{(2x+1)^2}$$

. . . .

$$f'(x) = 0 \iff x = 0,\quad x_{1,2} = \frac{-1 \pm \sqrt{3}}{2}$$



$x = 0$ p. min

x_1, x_2 p. max