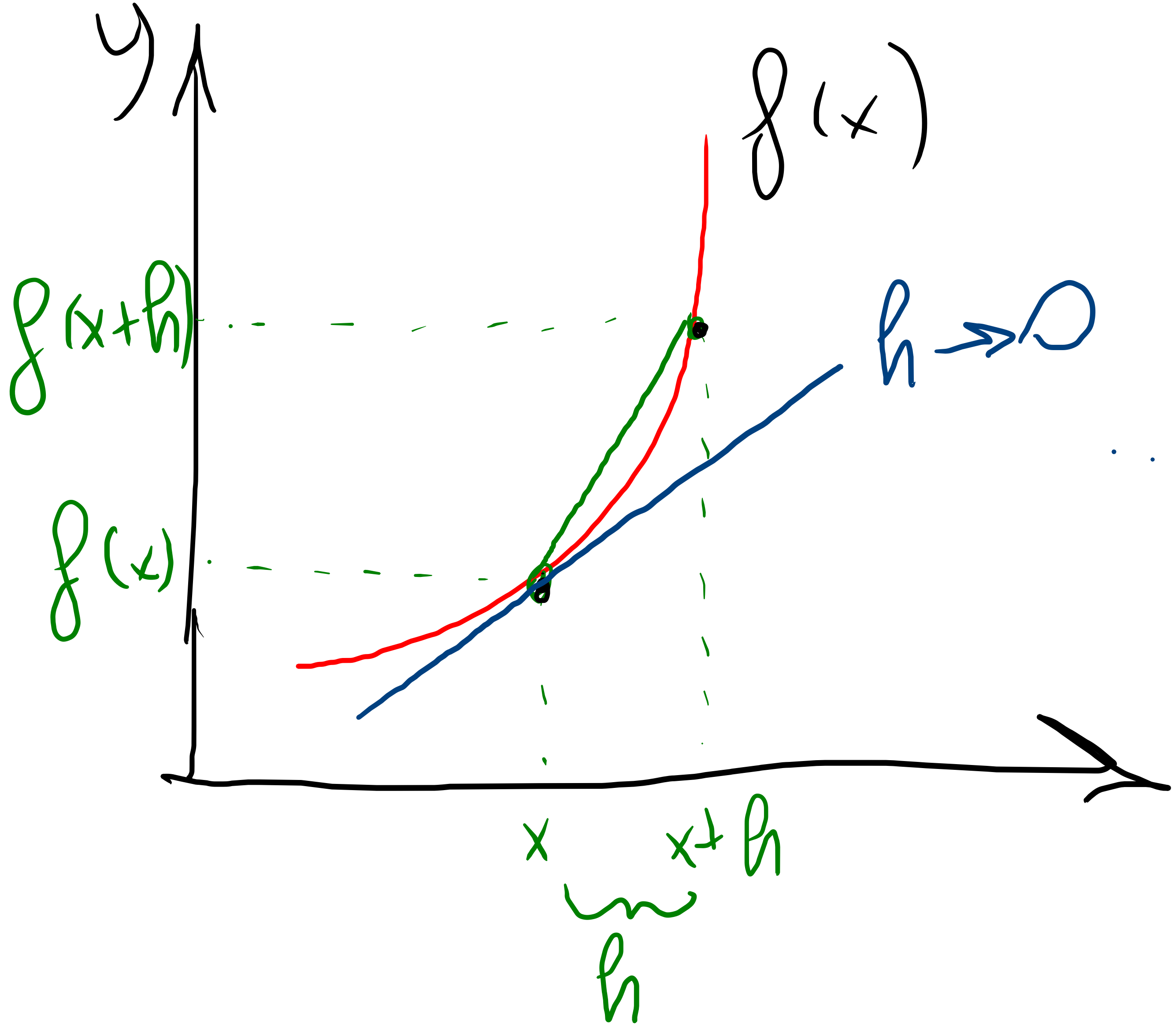
# DERIVATE

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{x \to x_0} \frac{f(x+x_0) - f(x)}{x - x_0}$$




$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

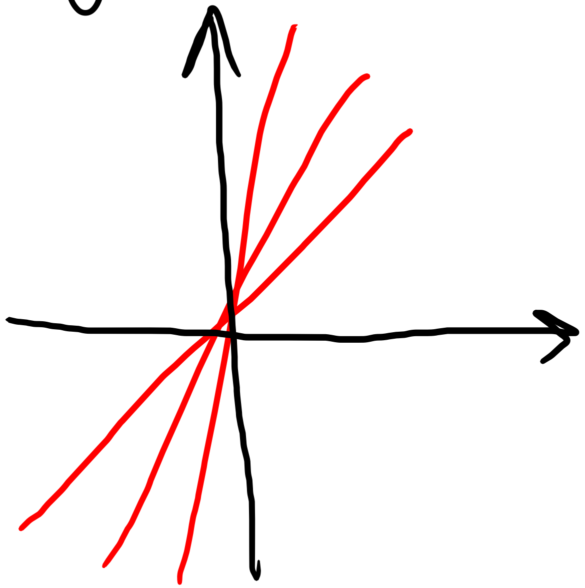
La derivata è il coefficiente angolare (m) della retta tangente in un punto

$$y = mx + q$$

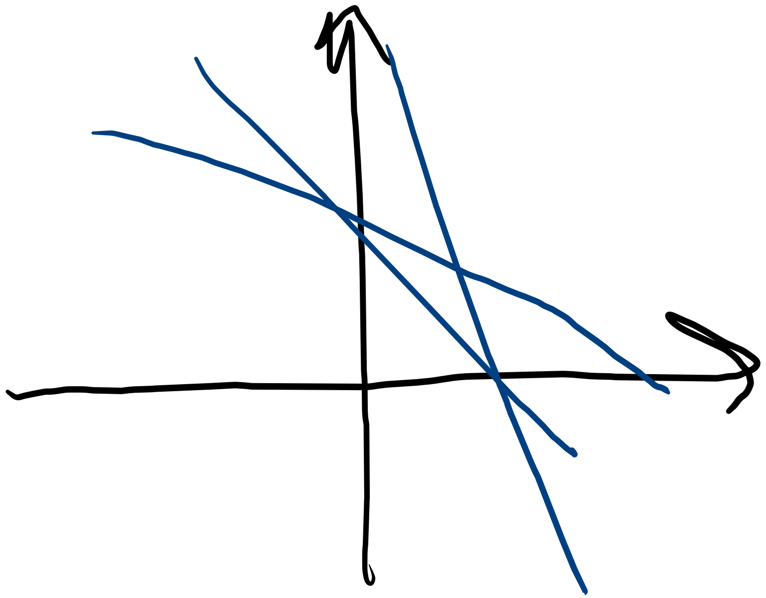
Sapere quanto vale m ci dà indicazioni sull' andamento della funzione nell' intorno di un punto....

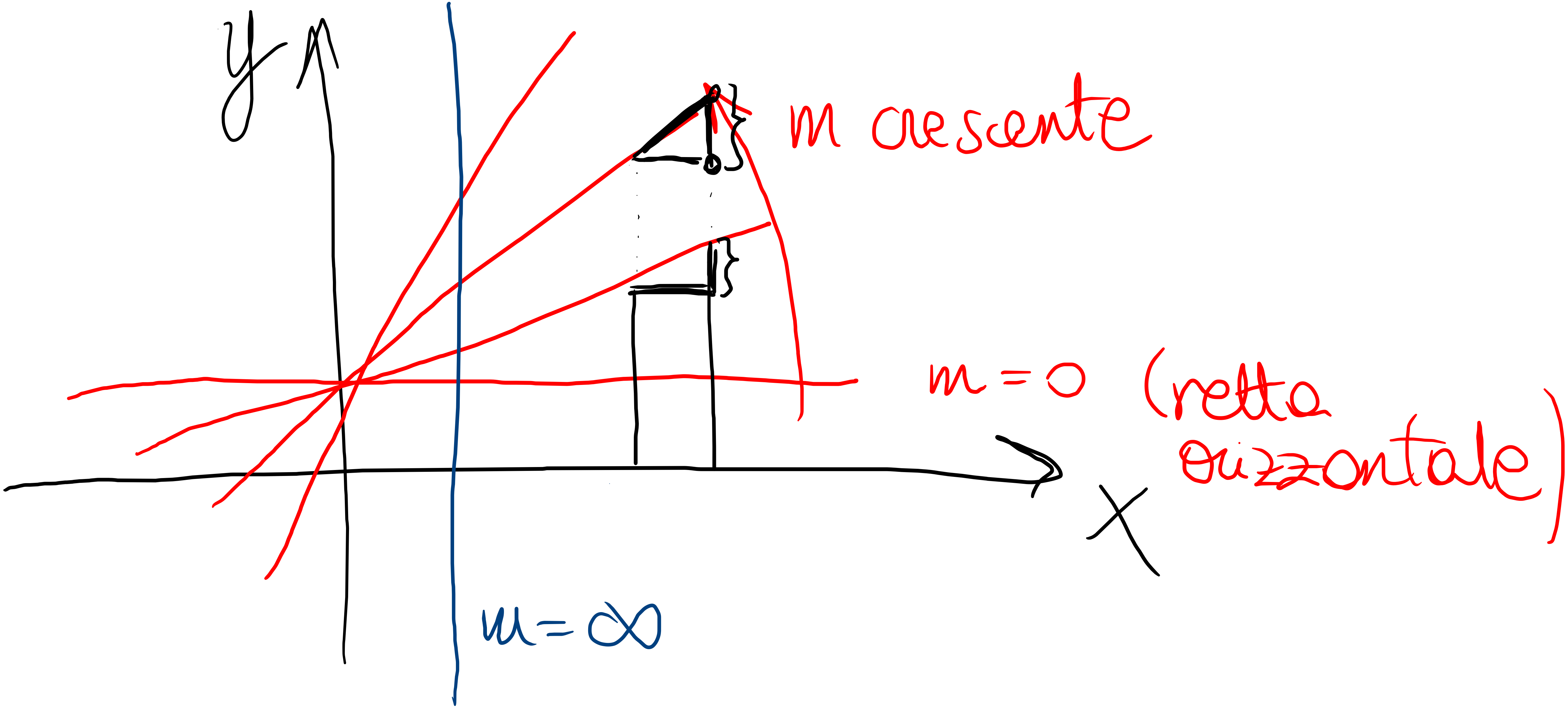
Riposo...

$m > 0$

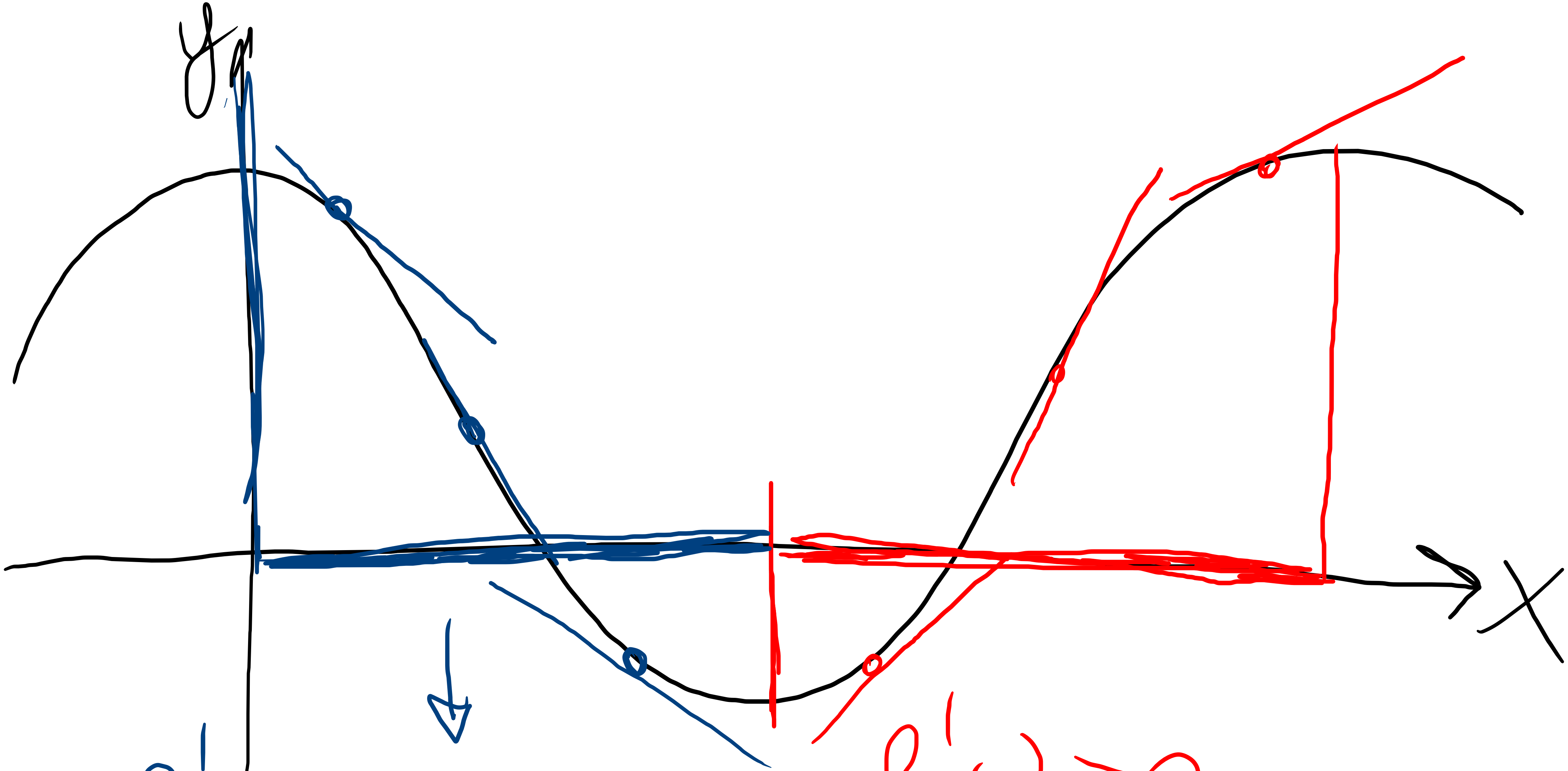


$m < 0$





y
x
m crescente
m = 0 (retta orizzontale)
m = ∞




$f'(x) < 0$ f. DECRESCENTE

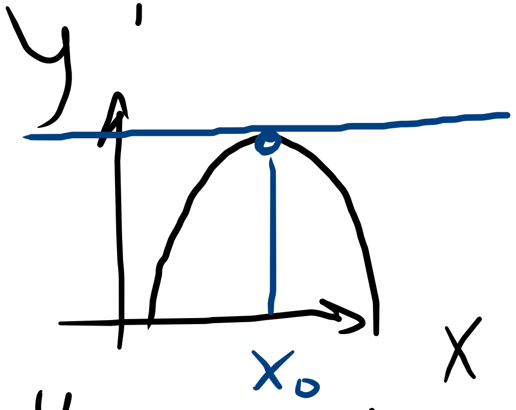
$f'(x) > 0$ f. CRESCENTE

Cosa succede se $f'(x) = 0$?

PUNTI STAZIONARI

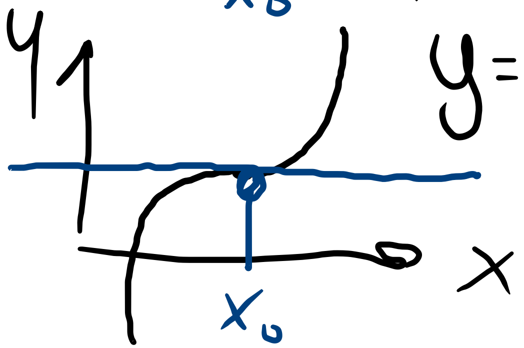
$f'(x_0) = 0$

MASSIMO

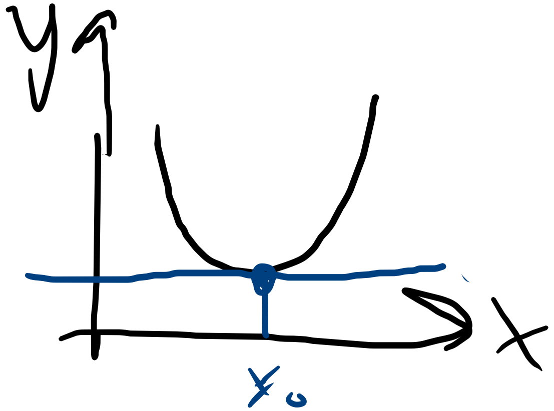



FLESSI A TG ORIZZONTALE

es: $y = x^3$




MINIMI

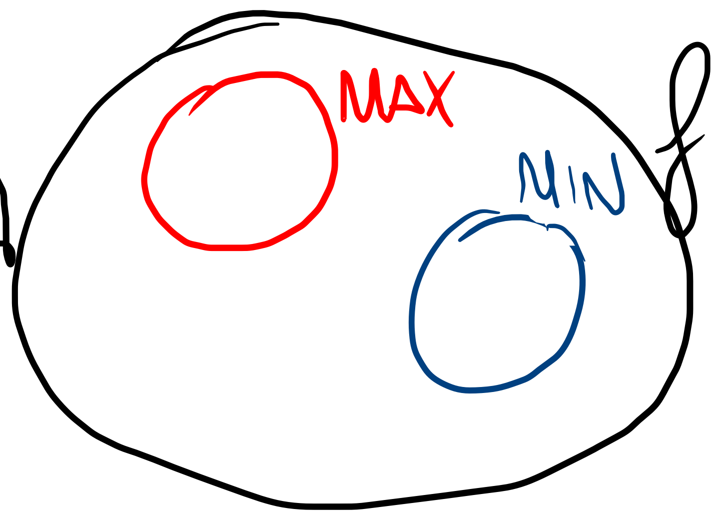


⚠ Un massimo / minimo deve avere $f'(x) = 0$

MA

Se $f'(x) = 0$ non è detto che sia max / min

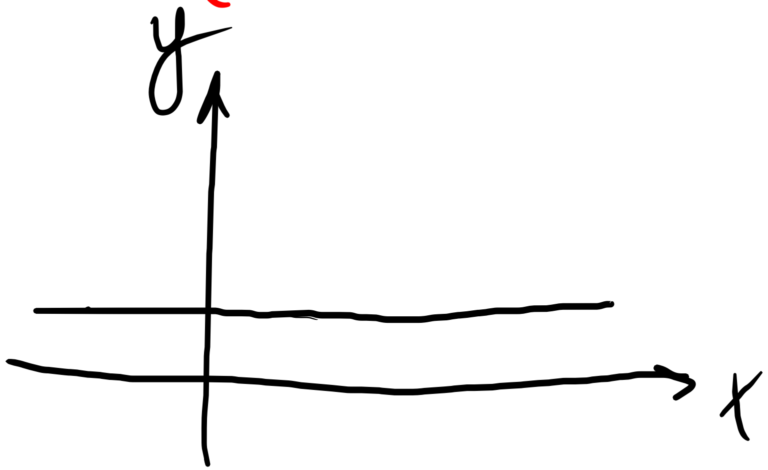
Cond. NECESSARIA ma NON SUFF




$f'(x) = 0$

1) $f(x) = x^n \Rightarrow f'(x) = n x^{n-1}$

$f(x) = \text{cost} \Rightarrow f'(x) = 0$




$f(x) = \sqrt{x} = (x)^{\frac{1}{2}} \Rightarrow f'(x) = \dfrac{1}{2\sqrt{x}}$

$f'(x) = \frac{1}{2}(x)^{-\frac{1}{2}} =$

$$f(x) = \sqrt[3]{x} = x^{1/3} \Rightarrow f'(x) = \frac{1}{3} x^{-\frac{2}{3}} =$$

$$= \frac{1}{3\sqrt[3]{x^2}}$$

$$f(x) = \frac{1}{x^2} = x^{-2} \Rightarrow f'(x) = -\frac{2}{x^3} \quad (= -2x^{-3})$$

$$f(x) = \sin x \Rightarrow f'(x) = \cos x$$

$$f(x) = \cos x \Rightarrow f'(x) = -\sin x$$

$$f(x) = \tan x \Rightarrow f'(x) = 1 + \tan^2 x = \frac{1}{\cos^2 x}$$

$$= \frac{\sin^2 x + \cos^2 x}{\cos^2 x}$$

$$\boxed{f(x) = e^x \Rightarrow f'(x) = e^x}$$

$$f(x) = \ln(x) \Rightarrow f'(x) = \frac{1}{x}$$

LA DERIVATA È UGUALE ALLA FUNZIONE

...accade solo se la base è $e \simeq 2{,}7...$)

# REGOLA DEL PRODOTTO

$$[f(x) \cdot g(x)]' \Rightarrow f'(x)\,g(x) + f(x)\,g'(x)$$

$$\left[\frac{f(x)}{g(x)}\right]' \Rightarrow \frac{f'(x)\,g(x) - f(x)\,g'(x)}{[g(x)]^2}$$