P1

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

$x^2 - 2x > 0$

$0 \quad 2 \quad x$

$+ \quad | \quad - \quad | \quad +$

$$f(x) = \begin{cases} x + (x^2 - 2x) & \text{se } x < 0 \cup x \geq 2 \\ x + (-x^2 + 2x) & \text{se } 0 \leq x < 2 \end{cases} \Rightarrow \begin{cases} ① \; x^2 - x & x < 0 \cup x \geq 2 \\ ② \; -x^2 + 3x & 0 \leq x < 2 \end{cases}$$

$f_1(0) = \lim_{x \to 0^-} (x^2 - x) = 0 \qquad f_2(0) = -(0)^2 + 3(0) = 0$

$f(x)$ è continua per $x = 0$

$f_1(2) = (2)^2 - 2 = 2 \qquad f_2(2) = \lim_{x \to 2^-} (-x^2 + 3x) = 2$

$$f'(x) = \begin{cases} 2x - 1 & x < 0 \cup x \geq 2 \\ -2x + 3 & 0 \leq x < 2 \end{cases}$$

$f'_1(0) = \lim_{x \to 0^-} (2x - 1) = -1$

$f'_2(0) = -2(0) + 3 = 3$

in $x = 0$ $f(x)$ non è derivabile, $x = 0$ punto angoloso

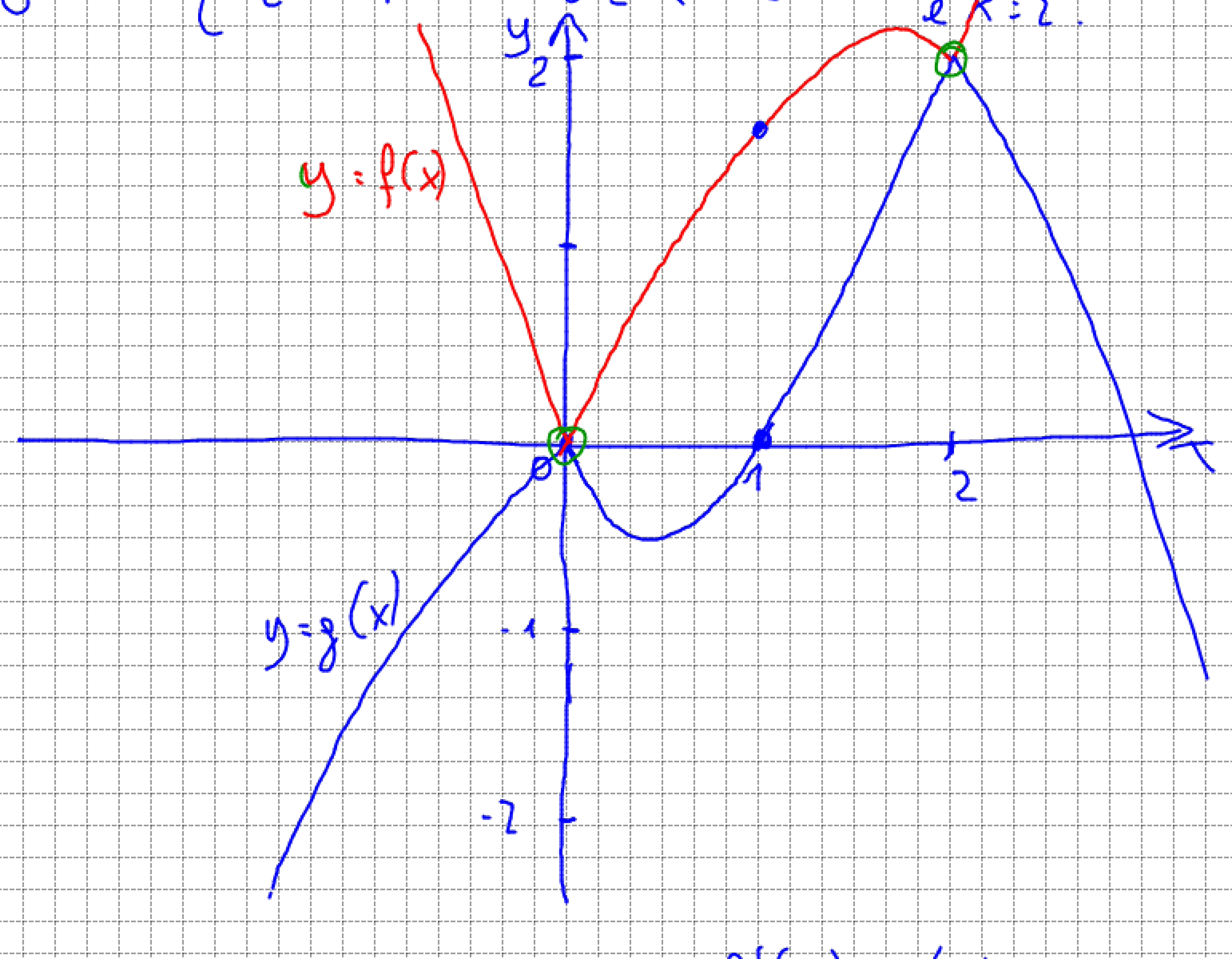
in $x = 2$ $f(x)$ non è derivabile, $x = 2$ punto angoloso

$$g(x) = \begin{cases} -x^2 + 3x & x < 0 \cup x \geq 2 \\ x^2 - x & 0 \leq x < 2 \end{cases}$$

continua in $x = 0$ e $x = 2$

$$g'(x) = \begin{cases} -2x + 3 & x < 0 \cup x \geq 2 \\ 2x - 1 & 0 \leq x < 2 \end{cases}$$

punti angolosi in $x = 0$ e $x = 2$.



in $x < 0 \cup x \geq 2$ $\quad f'(x) = g'(x) \quad 2x - 1 = -2x + 3$

$4x = 4 \quad x = 1 \quad$ NO!

in $0 \leq x < 2$ $\quad f'(x) = g'(x) \quad -2x + 3 = 2x - 1$

$\boxed{x = 1}$

$f(x) = x^3 - 2x^2 + 1 \quad y_0 = 1 \quad x \geq 1$

$g(y)$ inversa di $f(x) = y$ $\qquad f'(x) = 3x^2 - 4x$

$g'(y) = ?$

$\cancel{1} = x^3 - 2x^2 + \cancel{1} \quad x^2(x-2) = 0 \quad \cancel{x=0} \quad \boxed{x=2} \quad y=1$

$$g'(y) = \frac{1}{f'(x)} = \left.\frac{1}{3x^2 - 4x}\right|_{x=2} = \frac{1}{4}$$

$y = -4 \ln x^2 + x^2 \qquad -\frac{4}{x^2}\, 2x + 2x = 0 \quad 2x\left(-\frac{4}{x^2} + 1\right) = 0$

$x = 0$

$x = \pm 2$

$y = \operatorname{arctg}\left(\frac{\ln x}{x^2}\right) \qquad y' = D(\operatorname{arctg} X) \cdot D(X)$

$$y' = \frac{1}{1+X^2} \cdot \frac{\frac{1}{\cancel{x}} \cdot x^{\cancel{2}} - 2x \ln x}{x^4} = \frac{1}{1 + \left(\frac{\ln x}{x^2}\right)^2} = \frac{1 - 2\ln x}{x^3\left(1 + \frac{\ln^2 x}{x^4}\right)}$$