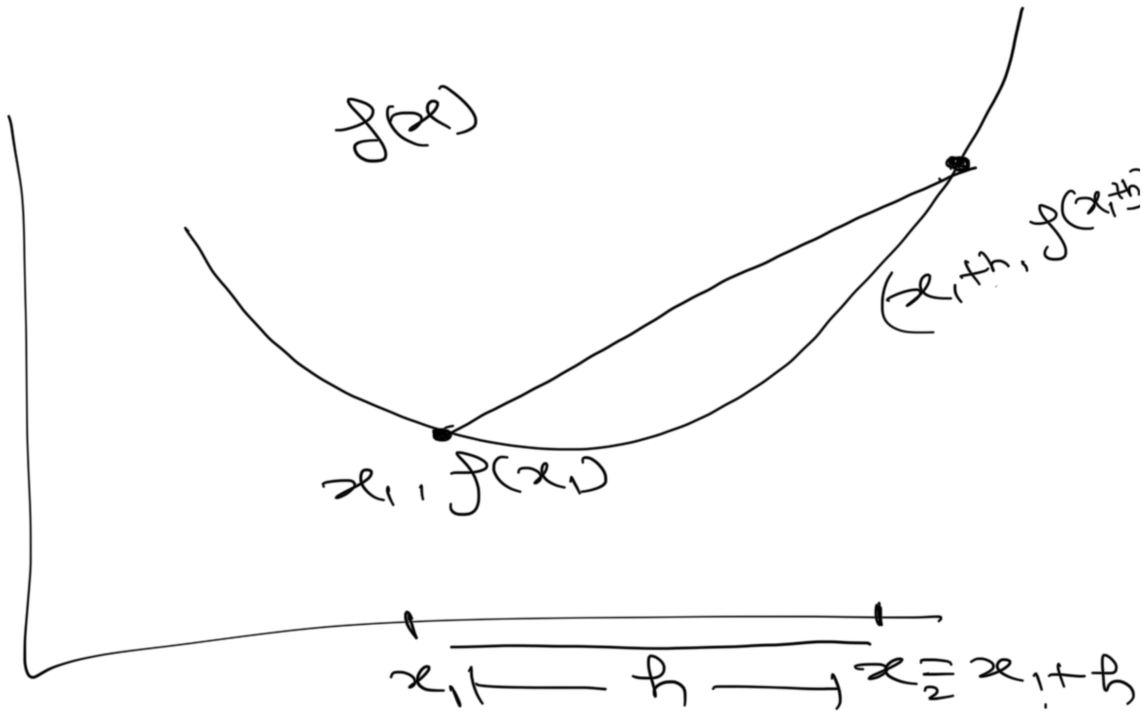
Ab initio Method

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

Smaller h will lead to more accurate Slope Value

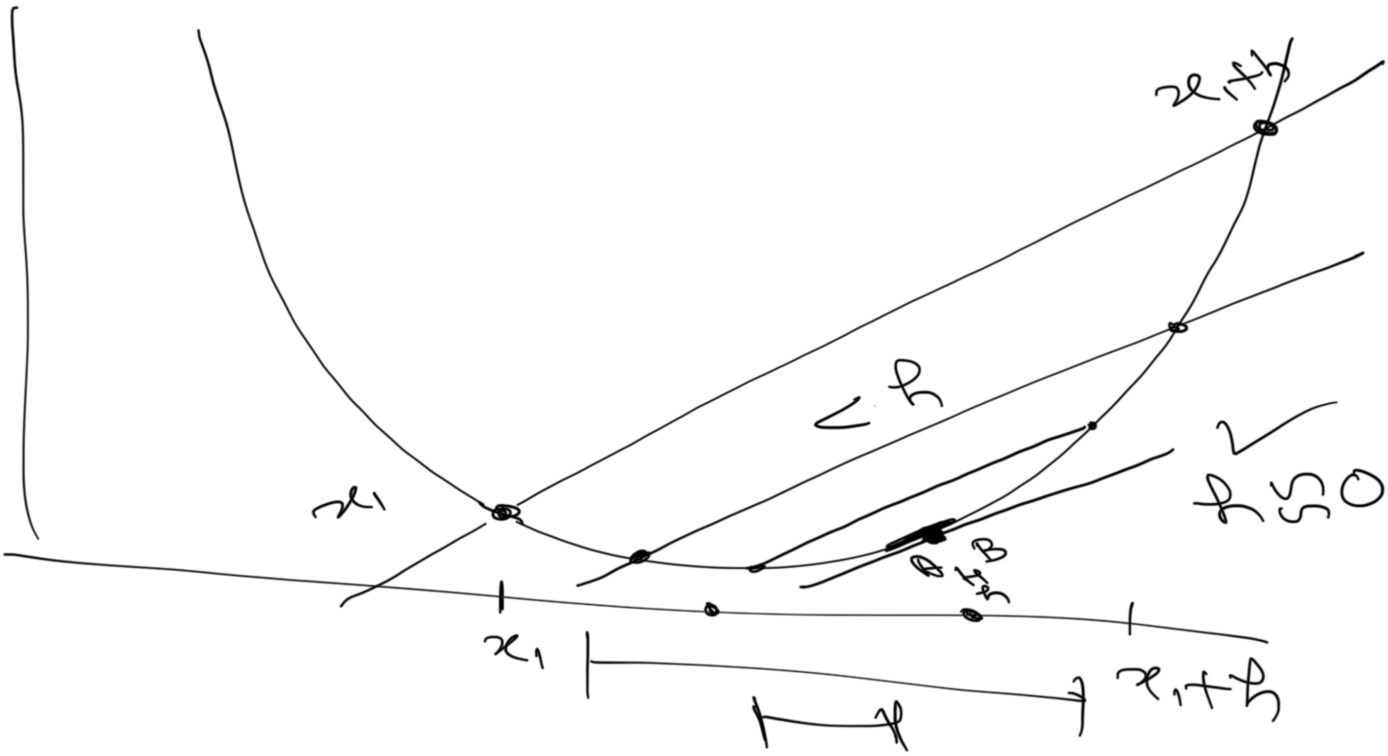


$x_1, y_1 \Rightarrow x_1, f(x_1)$

$x_2, y_2 \Rightarrow x_1 + h, f(x_1 + h)$

$$\frac{f(x_1+h)-f(x_1)}{\cancel{x_1}+h-\cancel{x_1}}$$

$$\Rightarrow \boxed{\frac{f(x_1+h)-f(x_1)}{h}}$$



$h \approx 0$

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

✓ & SO

0.0001
0.00001

H.W :-

To Calculate maxima and Minima

① $f'(x)$

② $f'(x) = 0$ and find values of x

③ $f''(x) \Rightarrow$ Substitut x

→ negative ⇒ Maxim

→ Positive ⇒ Minima

$f(x) \Rightarrow 3x^3 - 25x$

① $f'(x) = 9x^2 - 25$

② $f'(x) \Rightarrow 0$

$$9x^2 - 25 = 0$$

$$x^2 = \frac{25}{9} \qquad \Rightarrow x = \sqrt{\frac{25}{9}}$$

$$x = \pm\frac{5}{3} \qquad -\frac{5}{3}, \frac{5}{3}$$

③ $F''(x) \Rightarrow$

$30 \Rightarrow 18x \leftarrow \frac{5}{3} \Rightarrow +ve$ ✓

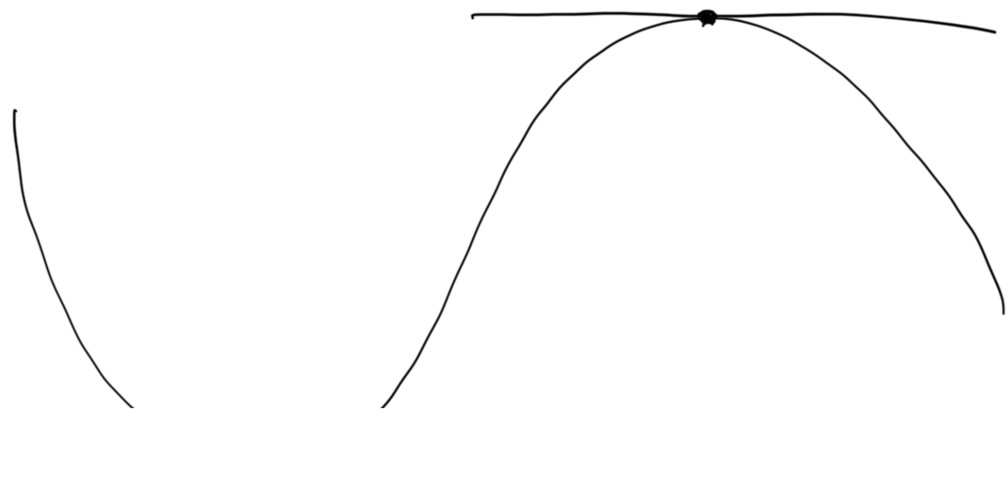
$-30 \Leftarrow 18(x)\left(-\frac{5}{3}\right) \Rightarrow -ve$

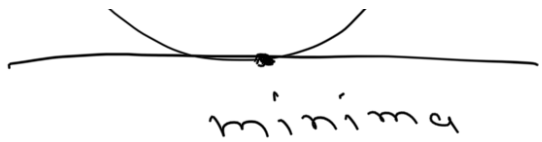
$-\frac{5}{3}$, $\frac{5}{3}$

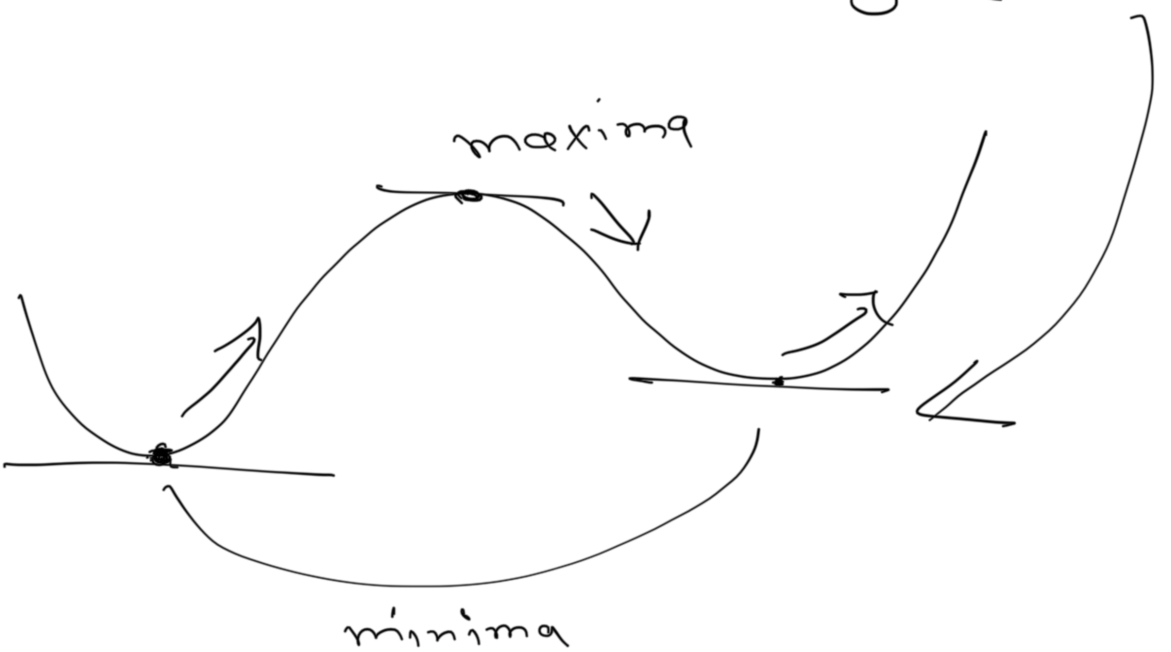
maxima

minima

maxima







f(x) ← 3 minin

$f\, x_1$

$f(x_2) \Rightarrow$ Global

$f(x_3)$

Chain Rule

$f(g(x)) \Rightarrow f'g(x) \cdot g'x$

$\Rightarrow \ln(3x^3+2x)$

$\ln g(x) \Rightarrow \frac{1}{g(x)} \Rightarrow \frac{1}{3x^2+2x}$

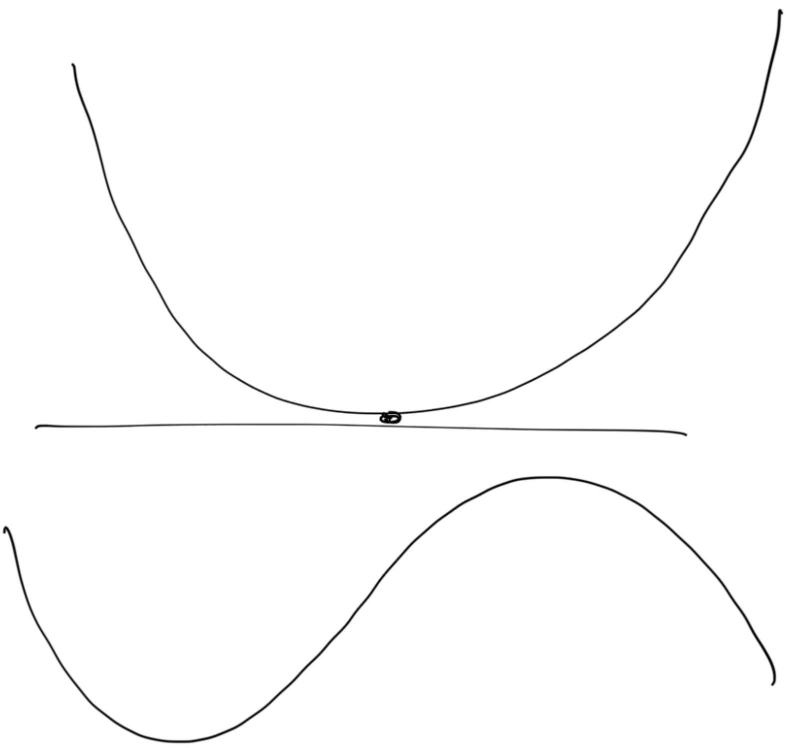
$g(x) \Rightarrow 3x^2+2x \Rightarrow 6x+2$

$\Rightarrow \frac{1}{3x^2+2x} \cdot 6x+2$

$\boxed{H.W \Rightarrow e^{x^2+2}}$

$x^3 \Rightarrow 2$

$x^2 \Rightarrow 1$



$\Rightarrow e^{x} \quad \ln(x) \quad x^3$

$f(x) \Rightarrow e$

$g(x) \Rightarrow \ln(x) \cdot x^3$

$f'(x) \cdot gx + g'x \cdot fx$

$\ln(x) \cdot x^3$ } Prod

$c(x \quad e(x)$

$c'x \cdot ex + e'x \cdot cx$