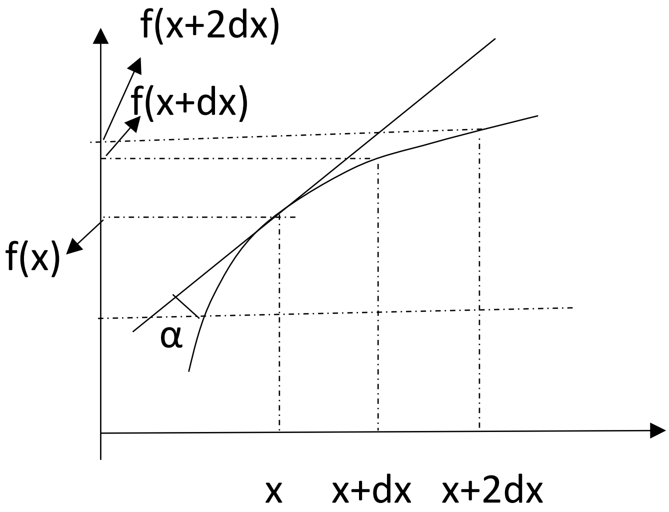
**Expressions de les derivades de grau$\geq$ 1:**

Sabem que $f'(x)=\frac{f(x+dx)-f(x)}{dx}$ =tgα

i $f(x+dx)= f(x)+ f'(x).dx/1! + f''(x).dx^2/2! + f'''(x).dx^3/3!+ \ldots$

(quan x=0)




i $f''(x)=\frac{[f'(x+dx).dx-f'(x)dx]dx-[f(x+dx)-f(x)]d\prime x}{dx^2}$

$f''(x)= f'(x+dx)-f'(x)$ ja que la derivada de dx és zero ($d'x=0$).

$f''(x)= \frac{f(x+2dx)dx-f(x+dx)dx}{dx}-\frac{f(x+dx)dx-f(x)dx}{dx}$

$f''(x)= f(x+2dx)-2\ [f(x+dx)] +f(x)$

$f'''(x)= \frac{[f''(x+dx)dx-f''(x)dx]dx-[f\prime(x+dx)-f'(x)]d\prime x}{dx^2}$

$f'''(x)= f''(x+dx)-f''(x)=f'(x+2dx)-f'(x+dx)-[f'(x+dx)-f'(x)]=$

$= \frac{[f(x+3dx)dx-f(x+2dx)dx]-2[f(x+2dx)dx-f(x+dx)dx]+[f(x+dx)dx-f(x)dx]}{dx}$

aleshores, $f'''(x)=f(x+3dx)-3[f(x+2dx)]+3[f(x+dx)]-f(x)$

si anem més lluny, calcularem $f^{IV}(x)$!!

se suposa que serà = f(x+4dx)- 4[f(x+3dx)]+6[f(x+2dx)]-4[f(x+dx)]+f(x)   (?).

comprobació:

$f(x)= -2x^3+x^2-4$    quan x=-2   i dx=1

$f'(x)= -6x^2+2x$        $f''(x)= -12x+2$     $f'''(x)= -12$

-1.f(x)= -f(-2)= -1.(16+4-4)= -16< 0

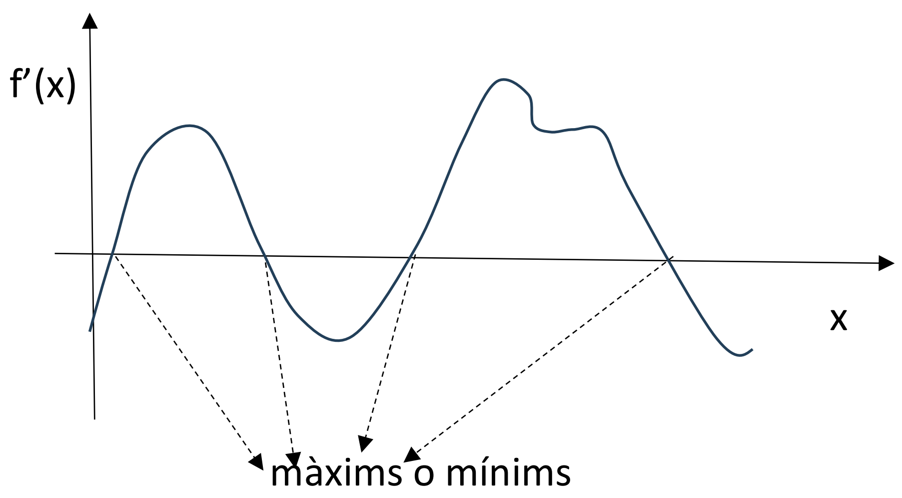
+3.f(x+dx)= 3.f(-1)= 3(2+1-4)= -3< 0

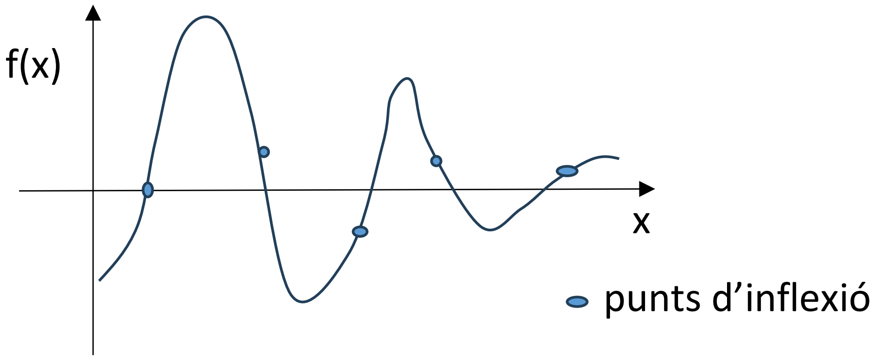
-3.f(x+2dx)= -3.f(0)= +12> 0

+1.f(x+3dx)= +1.f(1)= -5< 0

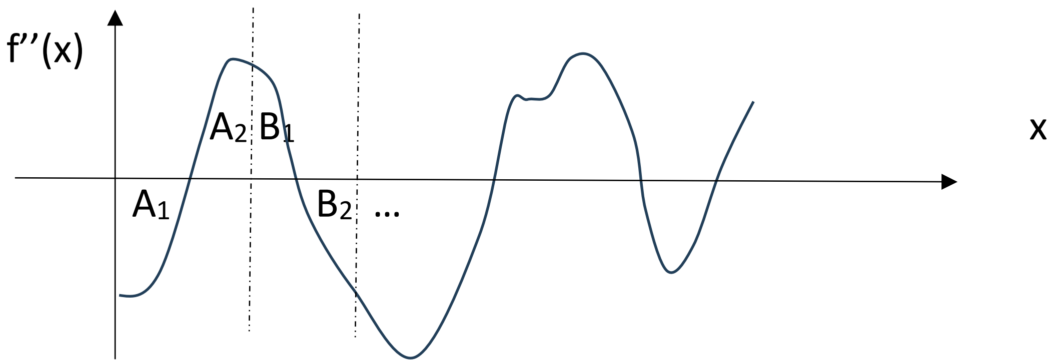
-12= -16-3+12-5= -12

Les gràfiques poden ser vàries, per exemple f(x) vs. x ,   f'(x) vs. x ,   f''(x)  vs. x :






sempre que f''(x)=0 tingui valor en "$x_1, x_2, \ldots x_n$" la funció f(x) serà contínua.




$A_1 + A_2 = 0$ $B_1 + B_2 = 0$ ...

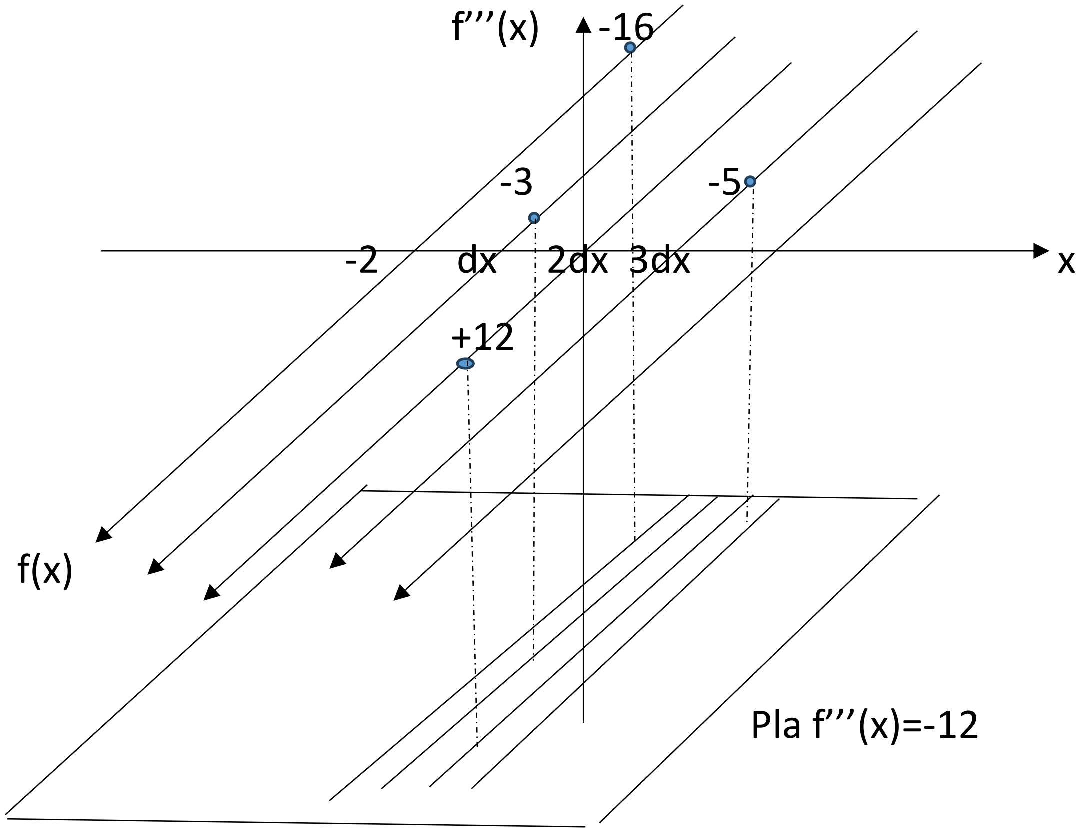
Disposem de x (punt), f'(x) (línea= x.x), f''(x) (àrea= L.x) i f'''(x) (volum=àrea.x).

$\int_{x_b}^{x_a} f'(x)dx = \sum longituds \to 0$

quan x→ ∞

$\int_{x_1}^{x_n} f''(x)dx = \sum àrees \to 0$

quan x→ ∞


f'''(x)
-16
-3
-5
-2
dx
2dx
3dx
x
+12
f(x)
Pla f'''(x)=-12