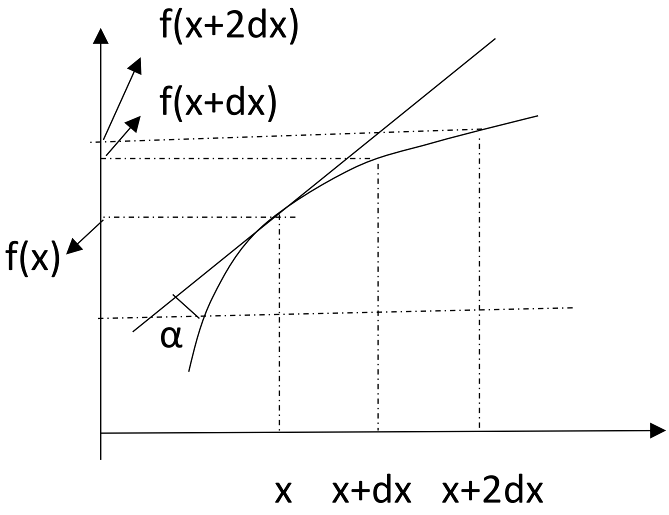
Expressions of derivatives of degree >2:

We know that f'(x)= $\frac{f(x+dx)-f(x)}{dx}$=tan α

and   f(x+dx)= f(x)+ f'(x).dx/1! + f''(x).dx ^{2}/2! + f'''(x).dx ^{3}/3!+ …

(when x=0)



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

f''(x)= f'(x+dx)-f'(x) since the derivative of dx is zero (dx=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)=$\frac{[f''(x+dx)dx-f''(x)dx]dx-[f'(x+dx)-f'(x)]d'x}{dx^2}$

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

=

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

then f'''(x)=f(x+3dx)-3[f(x+2dx)]+3[f(x+dx)]-f(x) if we go further, we will calculate $f^{IV}(x)$!!

it is supposed to be = f(x+4dx)- 4[f(x+3dx)]+6[f(x+2dx)]-4[f(x+dx)]+f(x) (?).

verification:

$f(x)= -2x^3+x^2-4$ when x=-2 and 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

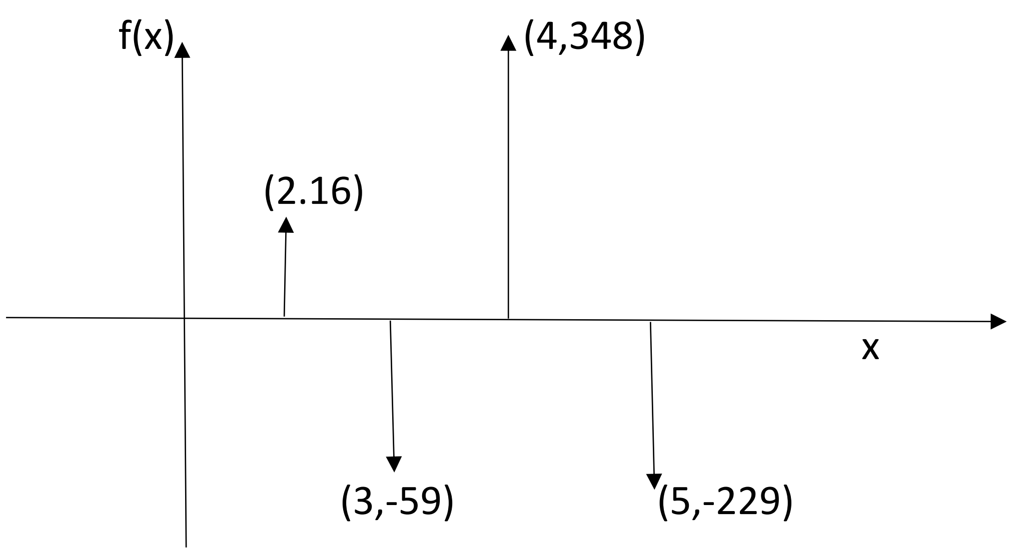
+3.f(x+dx)= 3.f(-1)= 3(2+1-4)= -3< 0

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

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

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

The sums give -12. Let's put a value of x and dx at random and see what result it gives.



3 points of intersection with the x-axis: 3 solutions to the equation.

Another example:

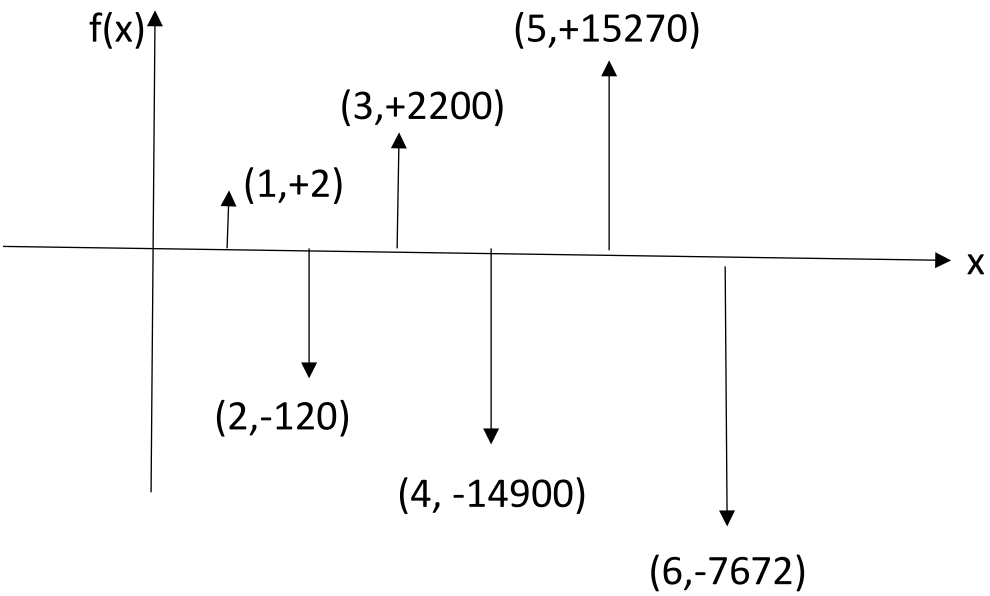
f(x)= $x^5 - 3x^2 + 4$ x= 1, dx= 1

$f^{V}(x)$= 1.f(x)-5.f(x+dx)+10.f(x+2dx)-10.f(x+3dx)+5.f(x+4dx)-1.f(x+5dx)

$f'(x)=5x^4-6x$ $f''(x)= 20x^3-6$ $f'''(x)= 60x^2$ $f^{IV}(x)= 120x$ $f^{V}(x)= 120$

1.f(1)= +2 , -5.f(2)= -120 , 10.f(3)= +2200 , -10.f(4)= -14900

+5.f(5)= +15270 , -1.f(6)= -7672



5 points of cuts: 5 solutions.

Equations of degree 2 are solved by the formula:

Ex: $ax^2-bx+c= 0$ x= $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ as you already know.