

1 Introduction

CrInGeCrInGeProduction.Supercringeintroductionhere :

2 Some basic knowledge about researching problem...

Let’s calculate smth with a given function:  $f(x, opa) = \ln(1.000 + x \cdot opa)$   
And let’s also introduce some parameters and constants we use in this work:  
List of used constants and variables:  
!-Constants (3): ! [0] e = 2.718282 ! [1] pi = 3.141593 ! [2] AbObA = 1337.228690 ! !-Variables (2): ! [3] x = 1.000000 ! [4] opa = 13.000000 ! !-Number of differentiates: 3  
!-Macloren’s accuracy: 3  
!-Tanget point: 0.200000  
!-Delta coverage: 2.500000  
!-Graph diapasone: [-1 : 15]  
Firstly, let’s simplify this expression (if possible):  $f(x, opa) = \ln(1.000 + x \cdot opa)$

3 Exploration of the expression as a function of multiple variables

Calculation value of function in the point BRITISH SCIENTISTS WERE SHOCKED, WHEN THEY COUNT IT!!!

In the point  $M_0(x_0, opa_0) = (1.000, 13.000)$  it’s value = 2.63906  
Personally, I’ve always thought about first derivation of something like that function... Haven’t you?  
But now, by using informatics and math skills I feel that I’m prepared enough to calculate it!  
1 step: Finding a derivation of opa  
When I was child, my father always told me: ”Remember, son:  
 $(opa)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
2 step: Finding a derivation of x  
thanks to the results of my colleagues’ scientific work, I know that:  
 $(x)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
3 step: Finding a derivation of x · opa  
What if:  
 $(x \cdot opa)’ = \dots = [\text{top secret}] = \dots =$   
= opa + x  
4 step: Finding a derivation of 1.000  
If someone asked me that in the middle of the night, I wouldn’t hesitate to say:  
 $(1.000)’ = \dots = [\text{top secret}] = \dots =$   
= 0.000  
5 step: Finding a derivation of  $1.000 + x \cdot opa$   
It’s really easy to find:  
 $(1.000 + x \cdot opa)’ = \dots = [\text{top secret}] = \dots =$   
= opa + x  
6 step: Finding a derivation of  $\ln(1.000 + x \cdot opa)$   
My friends always beat me, because I didn’t know that:  
 $(\ln(1.000 + x \cdot opa))’ = \dots = [\text{top secret}] = \dots =$   
=  $\frac{1.000}{1.000+x \cdot opa} \cdot (opa + x)$   
Congratulations! **The first derivation of the expression is:**  
 $f'(x, opa) = \frac{1.000}{1.000+x \cdot opa} \cdot (opa + x)$   
In the point  $M_0(x_0, opa_0) = (1.000, 13.000)$  it’s value = 1.00000

Finding the 3 derivation Let’s find the 1 derivation of the expression:

1 step: Finding a derivation of opa  
Sounds logical that it is the same as:  
 $(opa)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
2 step: Finding a derivation of x  
My roommate mumbled it in his sleep all night:  
 $(x)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
3 step: Finding a derivation of x · opa  
What if:  
 $(x \cdot opa)’ = \dots = [\text{top secret}] = \dots =$   
= opa + x  
4 step: Finding a derivation of 1.000  
While preparing for exams, I learned a lot of new things, for example:  
 $(1.000)’ = \dots = [\text{top secret}] = \dots =$   
= 0.000  
5 step: Finding a derivation of  $1.000 + x \cdot opa$   
Sounds logical that it is the same as:  
 $(1.000 + x \cdot opa)’ = \dots = [\text{top secret}] = \dots =$   
= opa + x  
6 step: Finding a derivation of  $\ln(1.000 + x \cdot opa)$   
I was asked not to tell anyone that:  
 $(\ln(1.000 + x \cdot opa))’ = \dots = [\text{top secret}] = \dots =$   
=  $\frac{1.000}{1.000+x \cdot opa} \cdot (opa + x)$   
Let’s find **the 2 derivation** of the expression:  
1 step: Finding a derivation of x  
Even my two-aged sister knows that:  
 $(x)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
2 step: Finding a derivation of opa  
I was asked not to tell anyone that:  
 $(opa)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
3 step: Finding a derivation of opa + x  
If someone asked me that in the middle of the night, I wouldn’t hesitate to say:  
 $(opa + x)’ = \dots = [\text{top secret}] = \dots =$   
= 2.000  
4 step: Finding a derivation of opa  
thanks to the results of my colleagues’ scientific work, I know that:  
 $(opa)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
5 step: Finding a derivation of x  
My roommate mumbled it in his sleep all night:  
 $(x)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
6 step: Finding a derivation of x · opa  
Even my two-aged sister knows that:  
 $(x \cdot opa)’ = \dots = [\text{top secret}] = \dots =$   
= opa + x  
7 step: Finding a derivation of 1.000  
Man... Just look:  
 $(1.000)’ = \dots = [\text{top secret}] = \dots =$   
= 0.000  
8 step: Finding a derivation of  $1.000 + x \cdot opa$   
For centuries, people have hunted for the secret knowledge that:  
 $(1.000 + x \cdot opa)’ = \dots = [\text{top secret}] = \dots =$   
= opa + x  
9 step: Finding a derivation of 1.000  
I was asked not to tell anyone that:  
 $(1.000)’ = \dots = [\text{top secret}] = \dots =$   
= 0.000  
10 step: Finding a derivation of  $\frac{1.000}{1.000+x \cdot opa}$   
For centuries, people have hunted for the secret knowledge that:  
 $(\frac{1.000}{1.000+x \cdot opa})’ = \dots = [\text{top secret}] = \dots =$   
=  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000}$   
11 step: Finding a derivation of  $\frac{1.000}{1.000+x \cdot opa} \cdot (opa + x)$   
When I was child, my father always told me: ”Remember, son:  
 $(\frac{1.000}{1.000+x \cdot opa} \cdot (opa + x))’ = \dots = [\text{top secret}] = \dots =$   
=  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000} \cdot (opa + x) + 2.000 \cdot \frac{1.000}{1.000+x \cdot opa}$   
Let’s find **the 3 derivation** of the expression:  
1 step: Finding a derivation of opa  
While preparing for exams, I learned a lot of new things, for example:  
 $(opa)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
2 step: Finding a derivation of x  
thanks to the results of my colleagues’ scientific work, I know that:  
 $(x)’ = \dots = [\text{top secret}] = \dots =$   
= 1.000  
3 step: Finding a derivation of x · opa  
Sounds logical that it is the same as:  
 $(x \cdot opa)’ = \dots = [\text{top secret}] = \dots =$   
= opa + x

4 **step**: Finding a derivation of 1.000  
A true prince must know that:  
 $(1.000)' = \dots = [\text{top secret}] = \dots =$   
 $= 0.000$   
5 **step**: Finding a derivation of  $1.000 + x \cdot opa$   
If someone asked me that in the middle of the night, I wouldn't hesitate to say:  
 $(1.000 + x \cdot opa)' = \dots = [\text{top secret}] = \dots =$   
 $= opa + x$   
6 **step**: Finding a derivation of 1.000  
If someone asked me that in the middle of the night, I wouldn't hesitate to say:  
 $(1.000)' = \dots = [\text{top secret}] = \dots =$   
 $= 0.000$   
7 **step**: Finding a derivation of  $\frac{1.000}{1.000+x \cdot opa}$   
My friends always beat me, because I didn't know that:  
 $(\frac{1.000}{1.000+x \cdot opa})' = \dots = [\text{top secret}] = \dots =$   
 $= \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
8 **step**: Finding a derivation of 2.000  
What if:  
 $(2.000)' = \dots = [\text{top secret}] = \dots =$   
 $= 0.000$   
9 **step**: Finding a derivation of  $2.000 \cdot \frac{1.000}{1.000+x \cdot opa}$   
Sounds logical that it is the same as:  
 $(2.000 \cdot \frac{1.000}{1.000+x \cdot opa})' = \dots = [\text{top secret}] = \dots =$   
 $= 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
10 **step**: Finding a derivation of  $x$   
thanks to the results of my colleagues' scientific work, I know that:  
 $(x)' = \dots = [\text{top secret}] = \dots =$   
 $= 1.000$   
11 **step**: Finding a derivation of  $opa$   
Even my two-aged sister knows that:  
 $(opa)' = \dots = [\text{top secret}] = \dots =$   
 $= 1.000$   
12 **step**: Finding a derivation of  $opa + x$   
While preparing for exams, I learned a lot of new things, for example:  
 $(opa + x)' = \dots = [\text{top secret}] = \dots =$   
 $= 2.000$   
13 **step**: Finding a derivation of  $opa$   
When I was child, my father always told me: "Remember, son:  
 $(opa)' = \dots = [\text{top secret}] = \dots =$   
 $= 1.000$   
14 **step**: Finding a derivation of  $x$   
It's really easy to find:  
 $(x)' = \dots = [\text{top secret}] = \dots =$   
 $= 1.000$   
15 **step**: Finding a derivation of  $x \cdot opa$   
For centuries, people have hunted for the secret knowledge that:  
 $(x \cdot opa)' = \dots = [\text{top secret}] = \dots =$   
 $= opa + x$   
16 **step**: Finding a derivation of 1.000  
If someone asked me that in the middle of the night, I wouldn't hesitate to say:  
 $(1.000)' = \dots = [\text{top secret}] = \dots =$   
 $= 0.000$   
17 **step**: Finding a derivation of  $1.000 + x \cdot opa$   
Sounds logical that it is the same as:  
 $(1.000 + x \cdot opa)' = \dots = [\text{top secret}] = \dots =$   
 $= opa + x$   
18 **step**: Finding a derivation of  $(1.000 + x \cdot opa)^{2.000}$   
I spend the hole of my life to find the answer and finally it's:  
 $((1.000 + x \cdot opa)^{2.000})' = \dots = [\text{top secret}] = \dots =$   
 $= 2.000 \cdot (1.000 + x \cdot opa) \cdot (opa + x)$   
19 **step**: Finding a derivation of  $x$   
While preparing for exams, I learned a lot of new things, for example:  
 $(x)' = \dots = [\text{top secret}] = \dots =$   
 $= 1.000$   
20 **step**: Finding a derivation of  $opa$   
I spend the hole of my life to find the answer and finally it's:  
 $(opa)' = \dots = [\text{top secret}] = \dots =$   
 $= 1.000$   
21 **step**: Finding a derivation of  $opa + x$   
When I was child, my father always told me: "Remember, son:  
 $(opa + x)' = \dots = [\text{top secret}] = \dots =$   
 $= 2.000$   
22 **step**: Finding a derivation of  $-1.000$   
For centuries, people have hunted for the secret knowledge that:  
 $(-1.000)' = \dots = [\text{top secret}] = \dots =$   
 $= 0.000$   
23 **step**: Finding a derivation of  $(-1.000) \cdot (opa + x)$   
What if:  
 $((-1.000) \cdot (opa + x))' = \dots = [\text{top secret}] = \dots =$   
 $= -2.000$   
24 **step**: Finding a derivation of  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
A true prince must know that:  
 $(\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}})' = \dots = [\text{top secret}] = \dots =$   
 $= \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^{2.000}}$   
25 **step**: Finding a derivation of  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}} \cdot (opa + x)$   
Man... Just look:  
 $(\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}} \cdot (opa + x))' = \dots = [\text{top secret}] = \dots =$   
 $= \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^{2.000}} \cdot (opa + x) + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
26 **step**: Finding a derivation of  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}} \cdot (opa + x) + 2.000 \cdot \frac{1.000}{1.000+x \cdot opa}$   
I was asked not to tell anyone that:  
 $(\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}} \cdot (opa + x) + 2.000 \cdot \frac{1.000}{1.000+x \cdot opa})' = \dots = [\text{top secret}] = \dots =$   
 $= \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^{2.000}} \cdot (opa + x) + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}} + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
**Finally... The 3 derivation of the expression:**  
 $f^{(3)}(x, opa) = \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^{2.000}} \cdot (opa + x) + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}} + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
BRITISH SCIENTISTS WERE SHOCKED AGAIN, WHEN THEY COUNT THE 3 DERIVATION OF THIS EXPRESSION!!!  
In the point  $M_0(x_0, opa_0) = (1.000, 13.000)$  it's value = 1.57143

**Finding partical derivations** Partial derivation of the expression on the variable x:

$\frac{\partial f}{\partial x} = 13.000 \cdot \frac{1.000}{1.000+13.000 \cdot x}$   
In the point  $M_0(x_0, opa_0) = (1.000, 13.000)$  it's value = 0.92857 !!!  
Partial derivation of the expression on the variable opa:  
 $\frac{\partial f}{\partial opa} = \frac{1.000}{1.000+opa}$   
In the point  $M_0(x_0, opa_0) = (1.000, 13.000)$  it's value = 0.07143 !!!

**Finding full derivation** Full derivation:

$\sqrt{(13.000 \cdot \frac{1.000}{1.000+13.000 \cdot x})^{2.000} + (\frac{1.000}{1.000+opa})^{2.000}}$   
In the point  $M_0(x_0, opa_0) = (1.000, 13.000)$  it's value = 0.93131 !!!

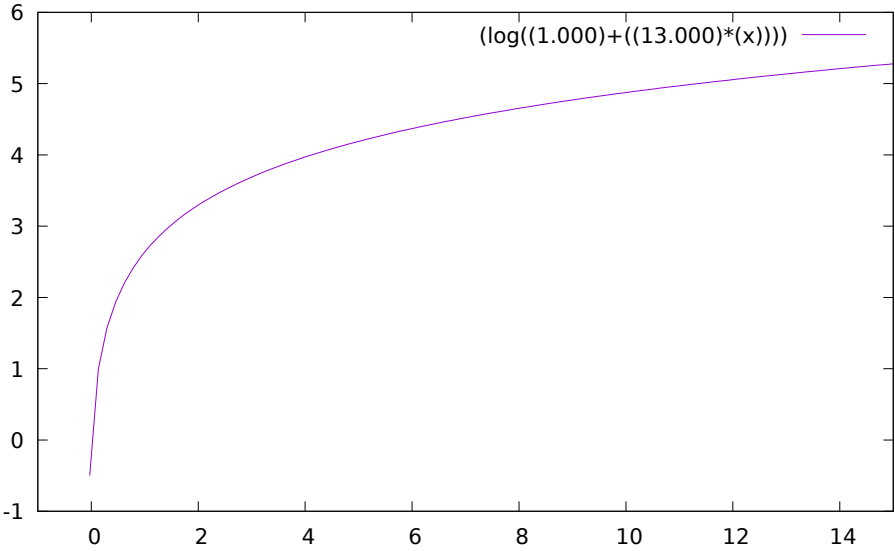
## 4 Exploration the expression as a function of the first variable

Now let's consider the expression as a function of x variable:  $f(x) = \ln(1.000 + 13.000 \cdot x)$

**Decomposing on Macloren's formula** Maklorens formula for  $x \rightarrow x_0 = 1.000$ :

$f(x) = 2.639 + 0.929 \cdot (x - 1.000) + (-0.431) \cdot (x - 1.000)^{2.000} + 0.267 \cdot (x - 1.000)^{3.000} + o((x - 1.000)^{3.000})$

Graphics    Graph  $f(x) = \ln(1.000 + 13.000 \cdot x)$  on the diapasone  $x \in [-1 : 15]$  :



Equations in the point    Tangent equation in the point  $x_0 = 0.200$ :

$f(x) = 3.611 \cdot (x - 0.200) + 1.281$

Normal equation in the point  $x_0 = 0.200$ :

$f(x) = (-0.277) \cdot (x - 0.200) + 1.281$

Their graphs in  $\delta = 2.50000$  coverage of the point  $x_0 = 0.200000$

