

1 Introduction

CrInGeCrInGeProduction.Supercringeintroductionhere :

2 Some basic knowledge about researching problem...

Let’s calculate smth with a given function: $f(x, opa) = \ln(1.000 + x \cdot opa)$
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 $x \cdot opa$
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 $x \cdot opa$
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 $x \cdot opa$
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 $x \cdot opa$
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:
 $(\frac{1.000}{1.000+x \cdot opa})' = \dots = [\text{top secret}] = \dots =$
 $= \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000}$
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:
 $(2.000 \cdot \frac{1.000}{1.000+x \cdot opa})' = \dots = [\text{top secret}] = \dots =$
 $= 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000}$
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 $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000}$
 A true prince must know that:
 $(\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000})' = \dots = [\text{top secret}] = \dots =$
 $= \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^2 \cdot 000}$
25 step: Finding a derivation of $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000} \cdot (opa + x)$
 Man... Just look:
 $(\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000} \cdot (opa + x))' = \dots = [\text{top secret}] = \dots =$
 $= \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^2 \cdot 000} \cdot (opa + x) + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000}$
26 step: Finding a derivation of $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000} \cdot (opa + x) + 2.000 \cdot \frac{1.000}{1.000+x \cdot opa}$
 I was asked not to tell anyone that:
 $(\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000} \cdot (opa + x) + 2.000 \cdot \frac{1.000}{1.000+x \cdot opa})' = \dots = [\text{top secret}] = \dots =$
 $= \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^2 \cdot 000} \cdot (opa + x) + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000} + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000}$
Finally... The 3 derivation of the expression:
 $f^{(3)}(x, opa) = \frac{(-2.000) \cdot (1.000+x \cdot opa)^{2.000} - 2.000 \cdot (1.000+x \cdot opa) \cdot (opa+x) \cdot (-1.000) \cdot (opa+x)}{((1.000+x \cdot opa)^{2.000})^2 \cdot 000} \cdot (opa + x) + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000} + 2.000 \cdot \frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^2 \cdot 000}$
 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 partial 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 !!!

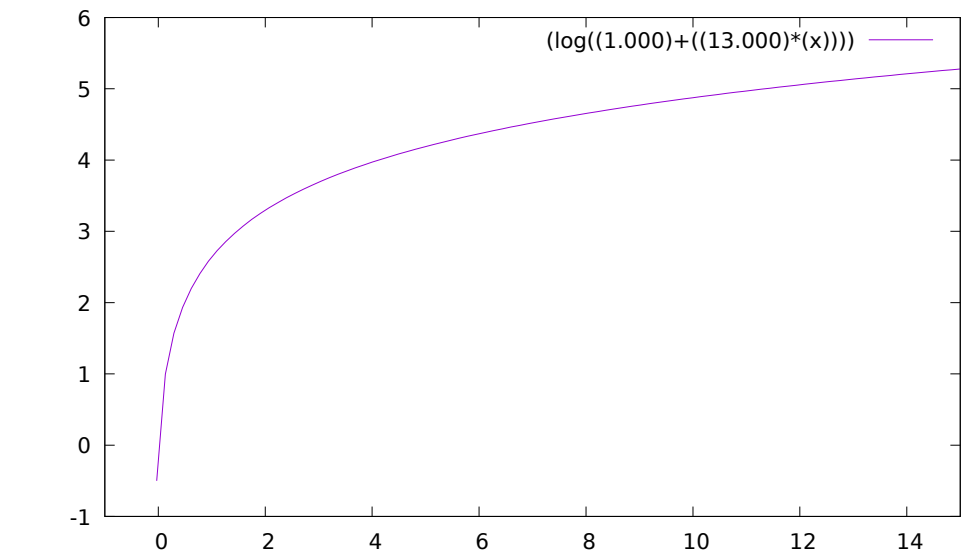
4 Exploration the expression as a function of the first variable

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

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

f(x) = 2.639 + 0.929 · (x − 1.000) + (−0.431) · (x − 1.000)^{2.000} + 0.267 · (x − 1.000)^{3.000} +o((x − 1.000)^{3.000})

Graphics **Graph** f(x) = ln(1.000 + 13.000 · 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 $x_0 = 0.200000$

