

1 Introduction

CrInGeCrInGeProduction.Supercringeintroductionhere :

2 Some basic knowledge about researching problem...

Parameters and constants we use in this work:

**Constants** (3):  
e = 2.718282  
pi = 3.141593  
AbObA = 1337.228690  
**Variables** (2):  
x = 1.000000  
opa = 13.000000  
**Parameters of exploration** :  
*Number of differentiates* : 3  
*Macloren's accuracy* : 3  
*Tanget point* : 0.200000  
*Delta coverage of tangent point*: 2.500000  
*Graph diapasone* : [−1 : 15]  
So 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:  
 $(\frac{1.000}{1.000+x \cdot opa})' = \dots = \text{top secret} = \dots =$   
=  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
**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:  
 $(\frac{1.000}{1.000+x \cdot opa} \cdot (opa + x))' = \dots = \text{top secret} = \dots =$   
=  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}} \cdot (opa + x) + 2.000 \cdot \frac{1.000}{1.000+x \cdot opa}$   
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:  
 $(\frac{1.000}{1.000+x \cdot opa})' = \dots = \text{top secret} = \dots =$   
=  $\frac{(-1.000) \cdot (opa+x)}{(1.000+x \cdot opa)^{2.000}}$   
**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 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 !!!

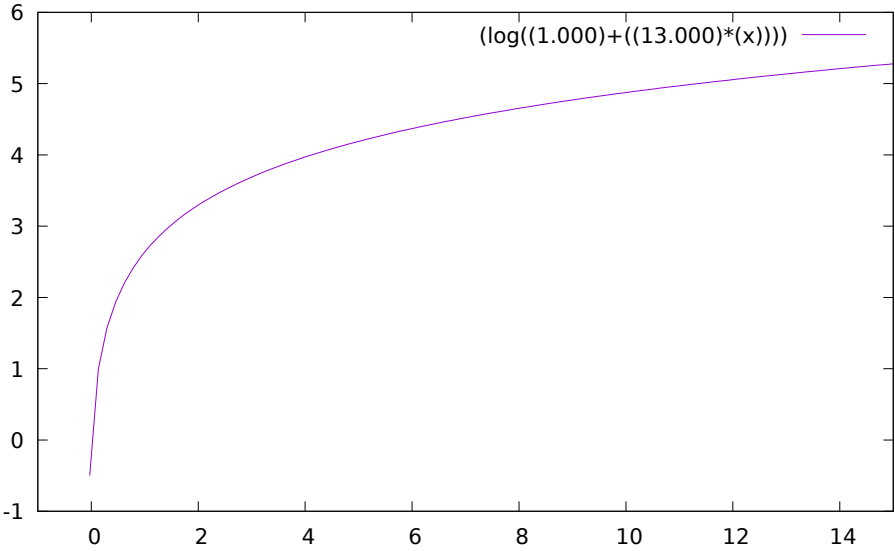
## 4 Exploration the expression as a function of the first variable

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

**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  $x_0 = 0.200000$

