

1 Introduction

CrInGeCrInGeProduction.Supercringeintroductionhere :

2 Some basic knowledge about researching problem...

Let’s calculate smth with a given function:  $f(x) = \ln(1.000 + x)$   
Firstly, let’s simplify this expression (if possible):  $f(x) = \ln(1.000 + x)$

3 Exploration of the expression

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

In the point  $M_0(x_0) = (1.000)$  **it’s value** = 0.69315  
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  $x$   
While preparing for exams, I learned a lot of new things, for example:  
 $(x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**2 step:** Finding a derivation of 1.000  
It’s really easy to find:  
 $(1.000)' = \dots = [\text{top secret}] = \dots =$   
= 0.000  
**3 step:** Finding a derivation of  $1.000 + x$   
My roommate mumbled it in his sleep all night:  
 $(1.000 + x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**4 step:** Finding a derivation of  $\ln(1.000 + x)$   
Sounds logical that it is the same as:  
 $(\ln(1.000 + x))' = \dots = [\text{top secret}] = \dots =$   
=  $\frac{1.000}{1.000+x}$   
Congratulations! **The first derivation of the expression** is:  
 $f'(x) = \frac{1.000}{1.000+x}$   
In the point  $M_0(x_0) = (1.000)$  it’s value = 0.50000

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

**1 step:** Finding a derivation of  $x$   
For centuries, people have hunted for the secret knowledge that:  
 $(x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**2 step:** Finding a derivation of 1.000  
Sounds logical that it is the same as:  
 $(1.000)' = \dots = [\text{top secret}] = \dots =$   
= 0.000  
**3 step:** Finding a derivation of  $1.000 + x$   
It’s really easy to find:  
 $(1.000 + x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**4 step:** Finding a derivation of  $\ln(1.000 + x)$   
My roommate mumbled it in his sleep all night:  
 $(\ln(1.000 + x))' = \dots = [\text{top secret}] = \dots =$   
=  $\frac{1.000}{1.000+x}$   
Let’s find **the 2 derivation** of the expression:  
**1 step:** Finding a derivation of  $x$   
What if:  
 $(x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**2 step:** Finding a derivation of 1.000  
It’s really easy to find:  
 $(1.000)' = \dots = [\text{top secret}] = \dots =$   
= 0.000  
**3 step:** Finding a derivation of  $1.000 + x$   
Even my two-aged sister knows that:  
 $(1.000 + x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**4 step:** Finding a derivation of 1.000  
When I was child, my father always told me: ”Remember, son:  
 $(1.000)' = \dots = [\text{top secret}] = \dots =$   
= 0.000  
**5 step:** Finding a derivation of  $\frac{1.000}{1.000+x}$   
I spend the hole of my life to find the answer and finally it’s:  
 $(\frac{1.000}{1.000+x})' = \dots = [\text{top secret}] = \dots =$   
=  $\frac{(-1.000) \cdot 1.000}{(1.000+x)^{2.000}}$   
Let’s find **the 3 derivation** of the expression:  
**1 step:** Finding a derivation of  $x$   
Man... Just look:  
 $(x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**2 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  
**3 step:** Finding a derivation of  $1.000 + x$   
It’s really easy to find:  
 $(1.000 + x)' = \dots = [\text{top secret}] = \dots =$   
= 1.000  
**4 step:** Finding a derivation of  $(1.000 + x)^{2.000}$   
It’s simple as fuck:  
 $((1.000 + x)^{2.000})' = \dots = [\text{top secret}] = \dots =$   
=  $2.000 \cdot (1.000 + x)$   
**5 step:** Finding a derivation of  $-1.000$   
thanks to the results of my colleagues’ scientific work, I know that:

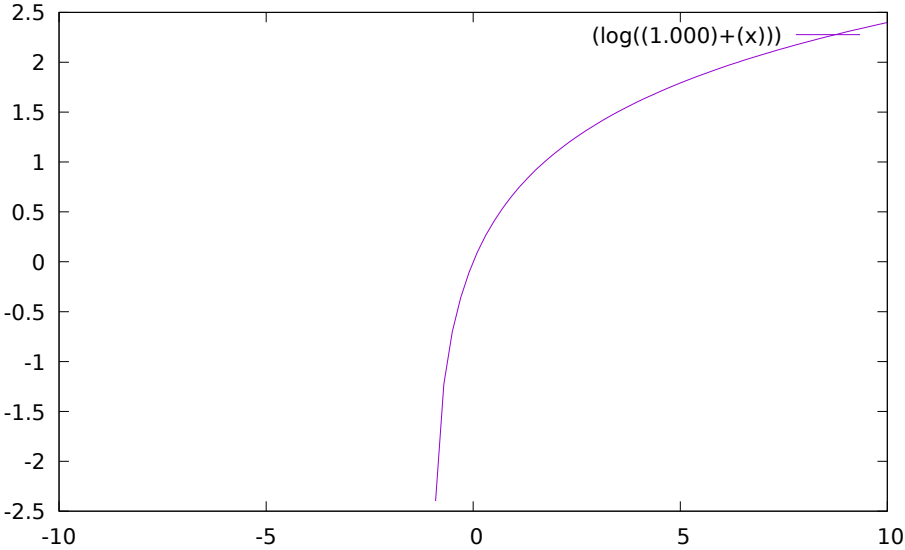
$(-1.000)' = \dots = [\text{top secret}] = \dots =$   
 $= 0.000$   
**6 step:** Finding a derivation of  $\frac{(-1.000)}{(1.000+x)^{2.000}}$   
When I was child, my father always told me: "Remember, son:  
 $(\frac{(-1.000)}{(1.000+x)^{2.000}})' = \dots = [\text{top secret}] = \dots =$   
 $= \frac{(-1.000) \cdot (-1.000) \cdot 2.000 \cdot (1.000+x)}{((1.000+x)^{2.000})^2.000}$   
**Finally... The 3 derivation of the expression:**  
 $f^{(3)}(x) = \frac{(-1.000) \cdot (-1.000) \cdot 2.000 \cdot (1.000+x)}{((1.000+x)^{2.000})^2.000}$   
BRITISH SCIENTISTS WERE SHOCKED AGAIN, WHEN THEY COUNT THE 3 DERIVATION OF THIS EXPRESSION!!!  
In the point  $M_0(x_0) = (1.000)$  it's value = 0.25000

**Finding partial derivations** Partial derivation of the expression on the variable x:  
 $\frac{\partial f}{\partial x} = \frac{1.000}{1.000+x}$   
In the point  $M_0(x_0) = (1.000)$  it's value = 0.50000 !!!

**Finding full derivation** Full derivation:  
 $\sqrt{\left(\frac{1.000}{1.000+x}\right)^{2.000}}$   
In the point  $M_0(x_0) = (1.000)$  it's value = 0.50000 !!!

**Decomposing on Macloren's formula Maklorems formula for  $x \rightarrow x_0 = 1.000$ :**  
 $f(x) = 0.693 + 0.500 \cdot (x - 1.000) + (-0.125) \cdot (x - 1.000)^{2.000} + 0.042 \cdot (x - 1.000)^{3.000} + (-0.016) \cdot (x - 1.000)^{4.000} + 0.006 \cdot (x - 1.000)^{5.000} + (-0.003) \cdot (x - 1.000)^{6.000} + \dots$

**Graphics Graph**  $f(x) = \ln(1.000 + x)$  on the diapasone  $x \in [-10 : 10]$  :



**Equations in the point Tangent equation** in the point  $x_0 = 1.000$ :  
 $f(x) = 0.500 \cdot (x - 1.000) + 0.693$   
**Normal equation** in the point  $x_0 = 1.000$ :  
 $f(x) = (-2.000) \cdot (x - 1.000) + 0.693$

