## 2 Some basic knowledge about researching problem...

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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)
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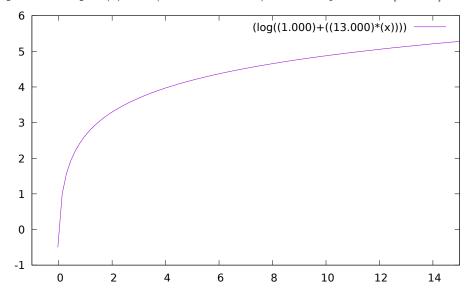
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Exploration of the expression as a function of multiple variables
Calculation value of function in the point BRITISH SCIENTISTS WERE SHOCKED, WHEN THEY COUNT IT!!!
   In the point M_0(x_0, opa_0) = (1.000, 13.000) it's value = 2.63906
   Personally, 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 = 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 = 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)' = ... = top secret = ... =
= 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 = top secret = ... =
= 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 = 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 = top secret = \dots =
   2 step: Finding a derivation of x
   My roommate mumbled it in his sleep all night:
   (x)' = ... = top secret = ... = 
   3 step: Finding a derivation of x \cdot opa
   (x \cdot opa)' = \dots = 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)' = ... = top secret = ... =
   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 = top secret = \dots =
   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)' = ... = top secret = ... = 
   2 step: Finding a derivation of opa
   I was asked not to tell anyone that:
   (opa)' = \dots = top secret = \dots = 
   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)' = ... = top secret = ... =
   4 step: Finding a derivation of opa
   thanks to the results of my colleagues' scientific work, I know that:
   (opa)' = \dots = top secret = \dots = 
   5 step: Finding a derivation of x
   My roommate mumbled it in his sleep all night:
   (x)' = ... = top secret = ... = 
   6 step: Finding a derivation of x \cdot opa
   Even my two-aged sister knows that:
   (x \cdot opa)' = \dots = top secret = \dots = 
   7 step: Finding a derivation of 1.000
   Man... Just look:
   (1.000)' = ... = top secret = ... = 
= 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 = top secret = \dots =
= opa + x
   9 step: Finding a derivation of 1.000
   I was asked not to tell anyone that:
   (1.000)' = \dots = top secret = \dots =
   10 step: Finding a derivation of \frac{1.000}{1.000+x\cdot opa}
For centuries, people have hunted for the secret knowledge that:
   \left(\frac{1.000}{1.000+x \cdot opa}\right)' = \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 \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 = top secret = \dots =
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2 step: Finding a derivation of x

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thanks to the results of my colleagues' scientific work, I know that:
    (x)' = ... = top secret = ... =
    3 step: Finding a derivation of x \cdot opa
    Sounds logical that it is the same as:
    (x \cdot opa)' = \dots = top secret = \dots =
    4 step: Finding a derivation of 1.000
    A true prince must know that:
    (1.000)' = ... = top secret = ... = 
    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 = top secret = \dots =
    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 =
    7 step: Finding a derivation of \frac{1.000}{1.000+x\cdot o}
    My friends always beat me, because I didn't know that:
    (\frac{1.000}{1.000+x \cdot opa})' = \dots = top secret = ... =
    \frac{(-1.000) \cdot (opa+x)}{(1.000) \cdot (opa+x)}
    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rac{(-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)' = ... = top secret = ... = 
= 1.000
    11 step: Finding a derivation of opa
    Even my two-aged sister knows that:
    (opa)' = \dots = 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)' = ... = top secret = ... =
= 2.000
    13 step: Finding a derivation of opa
    When I was child, my father always told me: "Remember, son:
    (opa)' = \dots = top secret = \dots =
= 1.000
    14 step: Finding a derivation of x
    It's really easy to find:
    (x)' = ... = top secret = ... = 
= 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 = 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 = 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:
                .. = top secret = ...
= 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)' = ... = top secret = ... =
= 1.000
    21 step: Finding a derivation of opa + x
     When I was child, my father always told me: "Remember, son:
    (opa + x)' = ... = top secret = ... =
= 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)
    ((-1.000) \cdot (opa + x))' = \dots = 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:
     \left(\frac{(-1.000)\cdot(opa+x)}{(1.000+x\cdot opa)^{2.000}}\right)' = \dots = \text{top secret} = \dots =
    (-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)
    \frac{(-2.000) \cdot (1.000 + x \cdot opa)}{((1.000 + x \cdot opa)^{2.000})^{2.000}} \cdot (opa + x)}{((1.000 + x \cdot opa)^{2.000})^{2.000}} \cdot (opa + x)}
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:
     \left(\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}\right)'=...=top secret =...=
   \frac{(-2.000) \cdot (1.000 + x \cdot opa)^{2.000} - 2.000 \cdot (1.000 + x \cdot opa)^{2.000} - 2.000 \cdot (1.000 + x \cdot opa)^{2.000} - 2.000 \cdot (1.000 + x \cdot opa)^{2.000}}{((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)}(\mathbf{x}, \text{ 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{\left(13.000 \cdot \frac{1.000}{1.000 + 13.000 \cdot x}\right)^{2.000} + \left(\frac{1.000}{1.000 + opa}\right)^{2.000}}
    In the point M_0(x_0, opa_0) = (1.000, 13.000) it's value = 0.93131 !!!
      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 \to 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})
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**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  $x_0 = 0.200000$ 

