

# Expression exploration

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## 1 Introduction

Worryingly, the importance of the derriviation is underestimated nowadays. In this extraordinary article I will show that the calculation and use of the derivative can be very interesting Our British scientists with Italian names living in America have spent about **17 YEARS, 14 MONTHS, and 47 DAYS** studying the derivative problem and writing universal and unique differentiator. This article fully presents the results of their work!

With this article, I want to restore the former greatness of mathematics and help the humanity, and what's more, most importantly, first-year students of the Moscow Institute of Physics and Technology!!!

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

Parameters and constants we use in this work (all data is qualified):

Constants (3):

e = 2.718282

pi = 3.141593

AbObA = 1337.228690

Variables (1):

x = 9.000000

Parameters of exploration :

*Number of differentiates* = 2

*Macloren's accuracy* = 3

*Tanget point* = 0.000000

*Delta coverage of tangent point* = 0.500000

*Graph diapasone* =  $[-2 : 2]$

So let's calculate smth with a given function:

$$f(x) = \sin(4 \cdot x) \cdot e^x$$

Firstly, let's insert all constants:

$$f(x) = \sin(4 \cdot x) \cdot 2.71828^x$$

## 3 Exploration of the expression

### - Calculation a value of function in the point

BRITISH SCIENTISTS WERE SHOCKED, WHEN THEY COUNT IT!!!  
In the point  $M_0(x_0) = (9.000)$  expression's value = -8036.46727

### - Finding the first derivation of function

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:

$$(x)' =$$

$$= 1$$

2 **step**: Finding a derivation of  $2.71828^x$

Only after two cups of beer you might understand it:

$$(2.71828^x)' =$$

$$= 1 \cdot 2.71828^x$$

3 **step**: Finding a derivation of  $x$

Never say it to girls:

$$(x)' =$$

$$= 1$$

4 **step**: Finding a derivation of 4

Only by using special skills we might know::

$$(4)' = \dots = \text{[top secret]} = \dots =$$

$$= 0$$

5 **step**: Finding a derivation of  $4 \cdot x$

What if:

$$(4 \cdot x)' =$$

$$= 4$$

6 **step**: Finding a derivation of  $\sin(4 \cdot x)$

Even my two-aged sister knows that:

$$(\sin(4 \cdot x))' =$$

$$= 4 \cdot \cos(4 \cdot x)$$

7 **step**: Finding a derivation of  $\sin(4 \cdot x) \cdot 2.71828^x$

The first task in MIPT was to calculate:

$$\begin{aligned} &(\sin(4 \cdot x) \cdot 2.71828^x)' = \\ &= 4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x) \end{aligned}$$

Congratulations! **The first derivation of the expression** is:

$$f'(x) = 4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x)$$

In the point  $M_0(x_0) = (9.000)$  **it's value = -12184.06933**

### - Finding the 2 derivation

1) Let's find **the 1 derivation** of the given function:

**1 step:** Finding a derivation of  $x$

Never say it to girls:

$$\begin{aligned} (x)' &= \\ &= 1 \end{aligned}$$

**2 step:** Finding a derivation of  $2.71828^x$

It's simple as fuck:

$$\begin{aligned} (2.71828^x)' &= \textcolor{red}{...} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{...} = \\ &= 1 \cdot 2.71828^x \end{aligned}$$

**3 step:** Finding a derivation of  $x$

As we know:

$$\begin{aligned} (x)' &= \\ &= 1 \end{aligned}$$

**4 step:** Finding a derivation of 4

I was asked not to tell anyone that:

$$\begin{aligned} (4)' &= \\ &= 0 \end{aligned}$$

**5 step:** Finding a derivation of  $4 \cdot x$

Only after two cups of beer you might understand it:

$$\begin{aligned} (4 \cdot x)' &= \textcolor{red}{...} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{...} = \\ &= 4 \end{aligned}$$

**6 step:** Finding a derivation of  $\sin(4 \cdot x)$

Even my two-aged sister knows that:

$$\begin{aligned} (\sin(4 \cdot x))' &= \\ &= 4 \cdot \cos(4 \cdot x) \end{aligned}$$

**7 step:** Finding a derivation of  $\sin(4 \cdot x) \cdot 2.71828^x$

Even my two-aged sister knows that:

$$\begin{aligned} (\sin(4 \cdot x) \cdot 2.71828^x)' &= \\ &= 4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x) \end{aligned}$$

So **the 1 derivation** of the function is:

$$4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x)$$

2) Let's find **the 2 derivation** of the given function:

**1 step:** Finding a derivation of  $x$

When I was a child, my father always told me: "Remember, son:

$$\begin{aligned} (x)' &= \\ &= 1 \end{aligned}$$

**2 step:** Finding a derivation of 4

I have no words to describe this fact:

$$\begin{aligned} (4)' &= \textcolor{red}{...} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{...} = \\ &= 0 \end{aligned}$$

**3 step:** Finding a derivation of  $4 \cdot x$

My roommate mumbled it in his sleep all night:

$$\begin{aligned} (4 \cdot x)' &= \textcolor{red}{...} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{...} = \\ &= 4 \end{aligned}$$

**4 step:** Finding a derivation of  $\sin(4 \cdot x)$

I have no words to describe this fact:

$$\begin{aligned} (\sin(4 \cdot x))' &= \textcolor{red}{...} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{...} = \\ &= 4 \cdot \cos(4 \cdot x) \end{aligned}$$

5 step: Finding a derivation of  $x$

While preparing for exams, I learned a lot of new things, for example:

$$\begin{aligned}(x)' &= \\ &= 1\end{aligned}$$

6 step: Finding a derivation of  $2.71828^x$

It's really easy to find:

$$\begin{aligned}(2.71828^x)' &= \\ &= 1 \cdot 2.71828^x\end{aligned}$$

7 step: Finding a derivation of 1

What if:

$$\begin{aligned}(1)' &= \textcolor{red}{\dots} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{\dots} = \\ &= 0\end{aligned}$$

8 step: Finding a derivation of  $1 \cdot 2.71828^x$

You should be aware of the fact that:

$$\begin{aligned}(1 \cdot 2.71828^x)' &= \\ &= 1 \cdot 1 \cdot 2.71828^x\end{aligned}$$

9 step: Finding a derivation of  $1 \cdot 2.71828^x \cdot \sin(4 \cdot x)$

A true prince must know that:

$$\begin{aligned}(1 \cdot 2.71828^x \cdot \sin(4 \cdot x))' &= \\ &= 1 \cdot 1 \cdot 2.71828^x \cdot \sin(4 \cdot x) + 4 \cdot \cos(4 \cdot x) \cdot 1 \cdot 2.71828^x\end{aligned}$$

10 step: Finding a derivation of  $x$

For centuries, people have hunted for the secret knowledge that:

$$\begin{aligned}(x)' &= \\ &= 1\end{aligned}$$

11 step: Finding a derivation of  $2.71828^x$

I spend the hole of my life to find the answer and finally it's:

$$\begin{aligned}(2.71828^x)' &= \textcolor{red}{\dots} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{\dots} = \\ &= 1 \cdot 2.71828^x\end{aligned}$$

12 step: Finding a derivation of  $x$

Never say it to girls:

$$\begin{aligned}(x)' &= \\ &= 1\end{aligned}$$

13 step: Finding a derivation of 4

It's really easy to find:

$$\begin{aligned}(4)' &= \\ &= 0\end{aligned}$$

14 step: Finding a derivation of  $4 \cdot x$

Sometimes I hear the same voice in my head, it always says:

$$\begin{aligned}(4 \cdot x)' &= \textcolor{red}{\dots} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{\dots} = \\ &= 4\end{aligned}$$

15 step: Finding a derivation of  $\cos(4 \cdot x)$

Even my two-aged sister knows that:

$$\begin{aligned}(\cos(4 \cdot x))' &= \\ &= 4 \cdot (-1) \cdot \sin(4 \cdot x)\end{aligned}$$

16 step: Finding a derivation of 4

Only by using special skills we might know::

$$\begin{aligned}(4)' &= \\ &= 0\end{aligned}$$

17 step: Finding a derivation of  $4 \cdot \cos(4 \cdot x)$

My friends always beat me, because I didn't know that:

$$\begin{aligned}(4 \cdot \cos(4 \cdot x))' &= \textcolor{red}{\dots} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{\dots} = \\ &= 4 \cdot 4 \cdot (-1) \cdot \sin(4 \cdot x)\end{aligned}$$

18 step: Finding a derivation of  $4 \cdot \cos(4 \cdot x) \cdot 2.71828^x$

A true prince must know that:

$$(4 \cdot \cos(4 \cdot x) \cdot 2.71828^x)' = \textcolor{red}{\dots} = \textcolor{red}{[\text{top secret}]} = \textcolor{red}{\dots} =$$

$$= 4 \cdot 4 \cdot (-1) \cdot \sin(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot 4 \cdot \cos(4 \cdot x)$$

**19 step:** Finding a derivation of  $4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x)$

Sometimes I hear the same voice in my head, it always says:

$$\begin{aligned} (4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x))' = \\ = 4 \cdot 4 \cdot (-1) \cdot \sin(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot 4 \cdot \cos(4 \cdot x) + 1 \cdot 1 \cdot 2.71828^x \cdot \sin(4 \cdot x) + 4 \cdot \cos(4 \cdot x) \cdot 1 \cdot 2.71828^x \end{aligned}$$

So **the 2 derivation** of the function is:

$$4 \cdot 4 \cdot (-1) \cdot \sin(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot 4 \cdot \cos(4 \cdot x) + 1 \cdot 1 \cdot 2.71828^x \cdot \sin(4 \cdot x) + 4 \cdot \cos(4 \cdot x) \cdot 1 \cdot 2.71828^x$$

**Finally... The 2 derivation of the expression:**

$$f^{(2)}(x) = 4 \cdot 4 \cdot (-1) \cdot \sin(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot 4 \cdot \cos(4 \cdot x) + 1 \cdot 1 \cdot 2.71828^x \cdot \sin(4 \cdot x) + 4 \cdot \cos(4 \cdot x) \cdot 1 \cdot 2.71828^x$$

BRITISH SCIENTISTS WERE SHOCKED AGAIN, BECAUSE THEY COUNT THE 2 DERIVATION OF THIS FUNCTION!!!

In the point  $M_0(x_0) = (9.000)$  **it's value = 112251.80501**

### - Finding partical derivations

Partical derivation of the expression on the variable **x**:

$$\frac{\partial f}{\partial x} = 4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x)$$

In the point  $M_0(x_0) = (9.000)$  **it's value = -12184.06933 !!!**

### - Finding full derivation

**Full derivation:**

$$\sqrt{(4 \cdot \cos(4 \cdot x) \cdot 2.71828^x + 1 \cdot 2.71828^x \cdot \sin(4 \cdot x))^2}$$

In the point  $M_0(x_0) = (9.000)$  **it's value = 12184.06933 !!!**

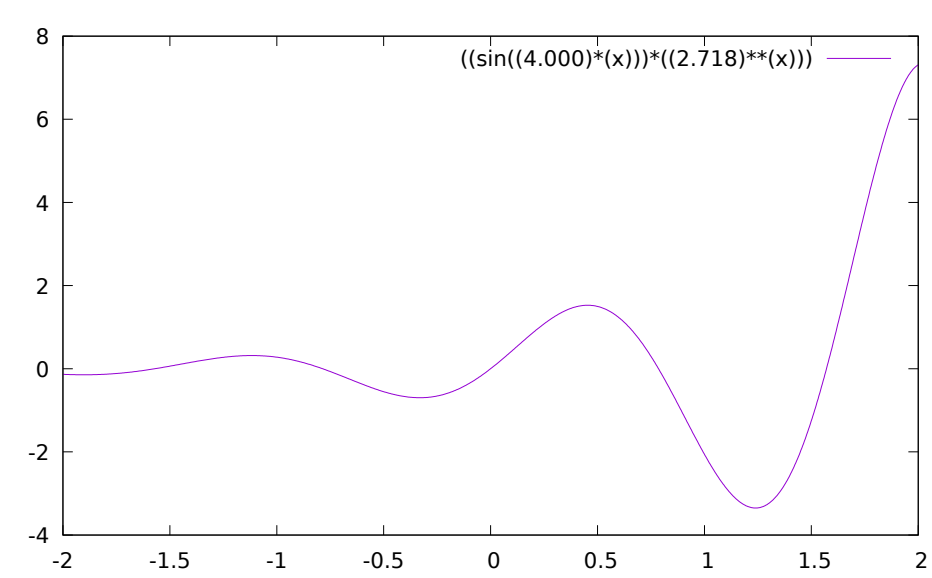
### - Decomposing on Macloren’s formula

**First 3 members of Maklorens decomposition for  $x \rightarrow x_0 = 9.000$ :**

$$f(x) = (-8036.47) + (-12184.1) \cdot (x - 9) + 56125.9 \cdot (x - 9)^2 + 71938.8 \cdot (x - 9)^3 + o((x - 9)^3)$$

### - Graphics

Graph of  $f(x) = \sin(4 \cdot x) \cdot 2.71828^x$  on the diapasone  $x \in [-2 : 2]$  :



### - Equations in the point

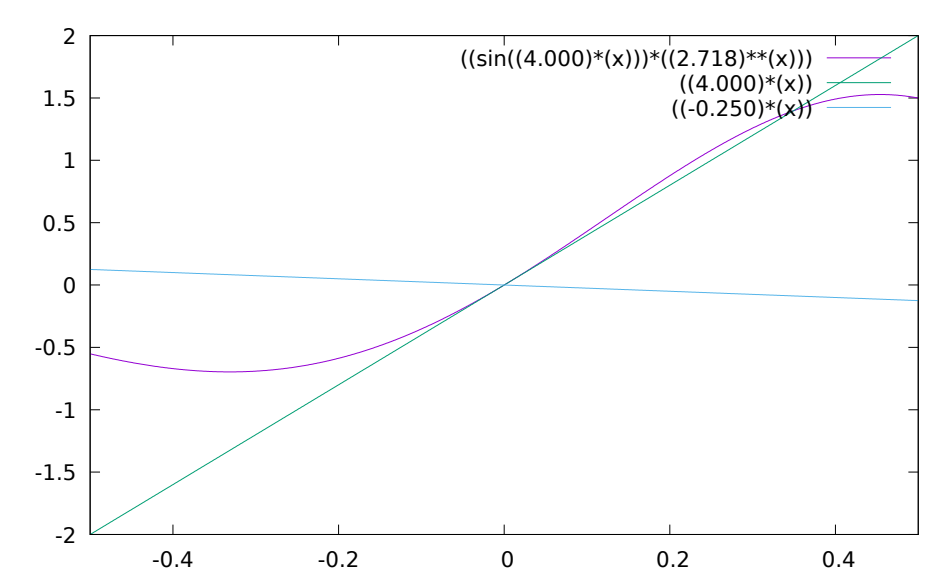
**Tangent equation** in  $x_0 = 0.000$ :

$$f(x) = 4 \cdot x$$

**Normal equation** in  $x_0 = 0.00000$ :

$$f(x) = (-0.25) \cdot x$$

**Their graphs** in  $\delta = 0.500$  coverage of the point  $x_0 = 0.000$ :



## 4 Conclusion

Thanks Ded for this amazing code experience and a lot of useful advice and care! Happy New Year!!! (Programming language is coming soon...)

Repository of the author  
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