# 1 Introduction

**Worryingly, the importance of the derriviation is underestimated these days.In this extraordinary article I will show that the calculation and use of the derivative can be very interesting**

# 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** (1):
x = 8.000000

**Parameters of exploration** :
*Number of differentiates* = 3
*Macloren's accuracy* = 3
*Tanget point* = 3.000000
*Delta coverage of tangent point* = 2.500000
*Graph diapasone* = $[-10 : 10]$

### So let's calculate smth with a given function:

$$\mathrm{f(x)} = (\cos x)^{3.000}$$

### Firstly, let's simplify this expression (if possible):

$$\mathrm{f(x)} = (\cos x)^{3.000}$$

# 3 Exploration the expression

## - Calculation a value of function in the point

BRITISH SCIENTISTS WERE SHOCKED, WHEN THEY COUNT IT!!!
In the point $M_0(x_0) = (8.000)$ expression's value = -0.00308

## - 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:

$(x)' =$

$= 1.000$

`2 step:` Finding a derivation of $\cos x$

Only after two cups of beer you might understand it:

$(\cos x)' =$

$= (-1.000) \cdot \sin x$

`3 step:` Finding a derivation of $(\cos x)^{3.000}$

Never say it to girls:

$((\cos x)^{3.000})' =$

$= 3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x$

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

$$\mathrm{f'(x)} = 3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x$$

In the point $M_0(x_0) = (8.000)$ **it's value = -0.06283**

## - Finding the 3 derivation

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

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

Only by using special skills we might know::

$(x)' =$ **... = [top secret] = ...** $=$

$= 1.000$

`2 step:` Finding a derivation of $\cos x$

What if:

$(\cos x)' =$

$= (-1.000) \cdot \sin x$

`3 step:` Finding a derivation of $(\cos x)^{3.000}$

Even my two-aged sister knows that:

$((\cos x)^{3.000})' =$

$= 3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x$

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

$$3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x$$

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

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

The first task in MIPT was to calculate:

$(x)' =$

$= 1.000$

`2 step:` Finding a derivation of $\sin x$

Never say it to girls:

$(\sin x)' =$

$= \cos x$

`3 step:` Finding a derivation of $-1.000$

It's simple as fuck:

$(-1.000)' =$ **... = [top secret] = ...** $=$

$= 0.000$

`4 step:` Finding a derivation of $(-1.000) \cdot \sin x$

As we know:

$((-1.000) \cdot \sin x)' =$

$= (-1.000) \cdot \cos x$

`5 step:` Finding a derivation of $x$

I was asked not to tell anyone that:

$(x)' =$

$= 1.000$

`6 step:` Finding a derivation of $\cos x$

Only after two cups of beer you might understand it:

$(\cos x)' =$ **... = [top secret] = ...** $=$

$= (-1.000) \cdot \sin x$

### 7 step: Finding a derivation of $(\cos x)^{2.000}$

Even my two-aged sister knows that:

$((\cos x)^{2.000})' =$

$= 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$

### 8 step: Finding a derivation of $3.000$

Even my two-aged sister knows that:

$(3.000)' =$

$= 0.000$

### 9 step: Finding a derivation of $3.000 \cdot (\cos x)^{2.000}$

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

$(3.000 \cdot (\cos x)^{2.000})' =$

$= 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$

### 10 step: Finding a derivation of $3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x$

I have no words to describe this fact:

$(3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x)' =$ **... = [top secret] = ...** $=$

$= 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot (\cos x)^{2.000}$

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

$3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot (\cos x)^{2.000}$

3) Let's find **the 3 derivation** of the given function:

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

My roommate mumbled it in his sleep all night:

$(x)' =$ **... = [top secret] = ...** $=$

$= 1.000$

### 2 step: Finding a derivation of $\cos x$

I have no words to describe this fact:

$(\cos x)' =$ **... = [top secret] = ...** $=$

$= (-1.000) \cdot \sin x$

### 3 step: Finding a derivation of $(\cos x)^{2.000}$

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

$((\cos x)^{2.000})' =$

$= 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$

### 4 step: Finding a derivation of $3.000$

It's really easy to find:

$(3.000)' =$

$= 0.000$

### 5 step: Finding a derivation of $3.000 \cdot (\cos x)^{2.000}$

What if:

$(3.000 \cdot (\cos x)^{2.000})' = \ldots = [\text{top secret}] = \ldots =$

$= 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$

### 6 step: Finding a derivation of $x$

You should be aware of the fact that:

$(x)' =$

$= 1.000$

### 7 step: Finding a derivation of $\cos x$

A true prince must know that:

$(\cos x)' =$

$= (-1.000) \cdot \sin x$

### 8 step: Finding a derivation of $-1.000$

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

$(-1.000)' =$

$= 0.000$

### 9 step: Finding a derivation of $(-1.000) \cdot \cos x$

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

$((-1.000) \cdot \cos x)' = \ldots = [\text{top secret}] = \ldots =$

$= (-1.000) \cdot (-1.000) \cdot \sin x$

### 10 step: Finding a derivation of $(-1.000) \cdot \cos x \cdot 3.000 \cdot (\cos x)^{2.000}$

Never say it to girls:

$((-1.000) \cdot \cos x \cdot 3.000 \cdot (\cos x)^{2.000})' =$

$= (-1.000) \cdot (-1.000) \cdot \sin x \cdot 3.000 \cdot (\cos x)^{2.000} + 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \cos x$

### 11 step: Finding a derivation of $x$

It's really easy to find:

$(x)' =$

$= 1.000$

### 12 step: Finding a derivation of $\sin x$

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

$(\sin x)' = \ldots = [\text{top secret}] = \ldots =$

$= \cos x$

### 13 step: Finding a derivation of $-1.000$

Even my two-aged sister knows that:

$(-1.000)' =$

$= 0.000$

### 14 step: Finding a derivation of $(-1.000) \cdot \sin x$

Only by using special skills we might know::

$((-1.000) \cdot \sin x)' =$

$= (-1.000) \cdot \cos x$

### 15 step: Finding a derivation of $x$

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

$(x)' =$ **... = [top secret] = ...** $=$

$= 1.000$

### 16 step: Finding a derivation of $\sin x$

A true prince must know that:

$(\sin x)' =$ **... = [top secret] = ...** $=$

$= \cos x$

### 17 step: Finding a derivation of $-1.000$

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

$(-1.000)' =$

$= 0.000$

### 18 step: Finding a derivation of $(-1.000) \cdot \sin x$

Only by using special skills we might know::

$((-1.000) \cdot \sin x)' =$ **... = [top secret] = ...** $=$

$= (-1.000) \cdot \cos x$

### 19 step: Finding a derivation of $x$

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

$(x)' =$

$= 1.000$

### 20 step: Finding a derivation of $\cos x$

She: please, never speak with my dad about math... Me: ok) Also me after homework of matan:

$(\cos x)' =$ **... = [top secret] = ...** $=$

$= (-1.000) \cdot \sin x$

### 21 step: Finding a derivation of $2.000$

My roommate mumbled it in his sleep all night:

$(2.000)' =$ **... = [top secret] = ...** $=$

$= 0.000$

### 22 step: Finding a derivation of $2.000 \cdot \cos x$

A true prince must know that:

$(2.000 \cdot \cos x)' =$ **... = [top secret] = ...** $=$

$= 2.000 \cdot (-1.000) \cdot \sin x$

### 23 step: Finding a derivation of $2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$

A true prince must know that:

$(2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x)' =$

$= 2.000 \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 2.000 \cdot \cos x$

### 24 step: Finding a derivation of $3.000$

If someone asked me that in the middle of the night, I wouldn't hesitate to say:

$(3.000)' =$

$= 0.000$

25 step: Finding a derivation of $3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$

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

$(3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x)' =$ **... = [top secret] = ...** $=$

$= 3.000 \cdot (2.000 \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 2.000 \cdot \cos x)$

26 step: Finding a derivation of $3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x$

thanks to the results of my colleagues' scientific work, I know that:

$(3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x)' =$

$= 3.000 \cdot (2.000 \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 2.000 \cdot \cos x) \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$

27 step: Finding a derivation of $3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot (\cos x)^{2.000}$

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

$(3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot (\cos x)^{2.000})' =$ **... = [top secret] = ...** $=$

$= 3.000 \cdot (2.000 \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 2.000 \cdot \cos x) \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x -$

So **the 3 derivation** of the function is:

$$3.000 \cdot (2.000 \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 2.000 \cdot \cos x) \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x$$

**Finally... The 3 derivation of the expression:**

$$f^{(3)}(\mathrm{x}) = 3.000 \cdot (2.000 \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 2.000 \cdot \cos x) \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.0$$

BRITISH SCIENTISTS WERE SHOCKED AGAIN, BECAUSE THEY COUNT THE 3 DERIVATION OF THIS FUNCTION!!!

In the point $M_0(x_0) = (8.000)$ **it's value = -5.37064**

## - Finding partical derivations

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

$\frac{\partial f}{\partial x} = 3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x$

In the point $M_0(x_0) = (8.000)$ **it's value = -0.06283** !!!

## - Finding full derivation

**Full derivation:**

$$\sqrt{(3.000 \cdot (\cos x)^{2.000} \cdot (-1.000) \cdot \sin x)^{2.000}}$$

In the point $M_0(x_0) = (8.000)$ **it's value = 0.06283** !!!

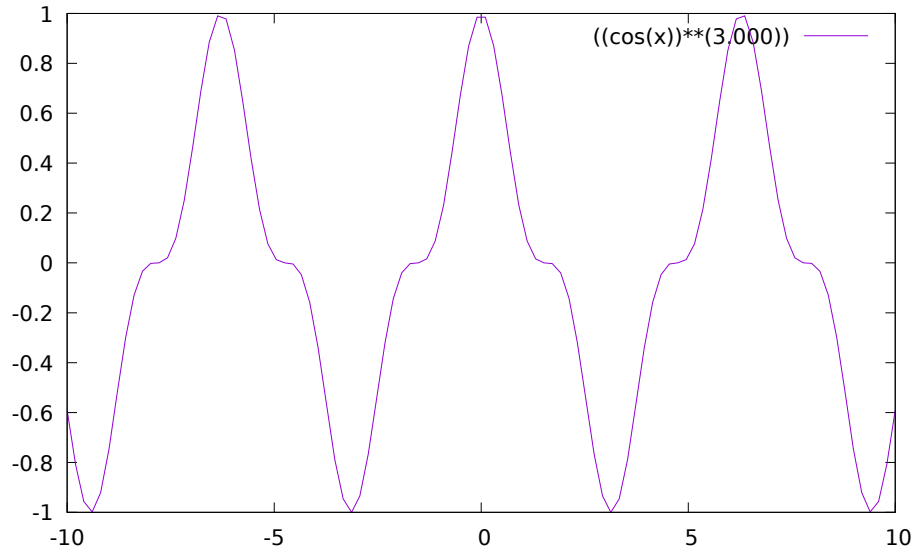
## - Decomposing on Macloren's formula

**Maklorens formula for $x \to x_0 = 8.000$:**

$$\mathrm{f(x)} = (-0.003) + (-0.063) \cdot (x - 8.000) + (-0.423) \cdot (x - 8.000)^{2.000} + (-0.895) \cdot (x - 8.000)^{3.000} + \mathrm{o}((x - 8.000)^{3.000})$$

## - Graphics

Graph of $\mathrm{f(x)} = (\cos x)^{3.000}$ on the diapasone $x \in [-10 : 10]$ :

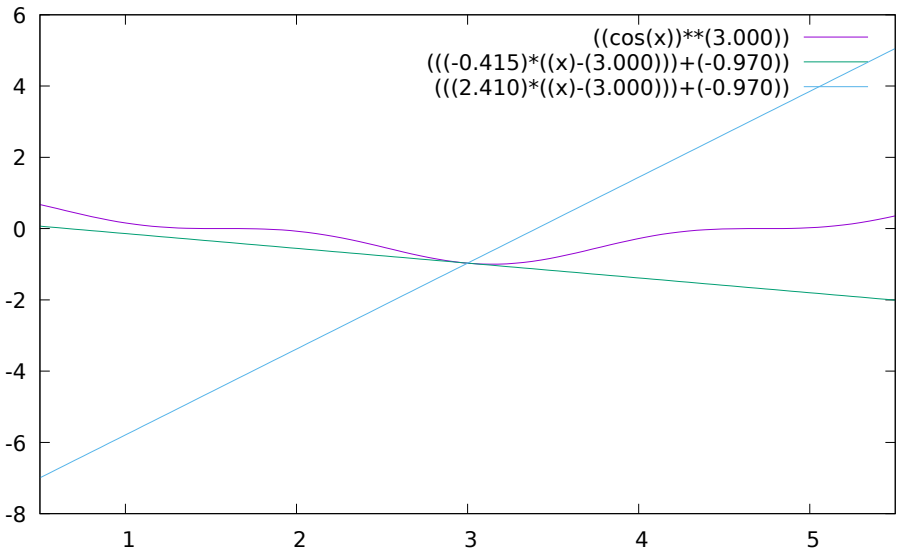



## - Equations in the point

**Tangent equation** in $x_0 = 3.000$:
$\mathrm{f(x)} = (-0.415) \cdot (x - 3.000) + (-0.970)$

**Normal equation** in $x_0 = 3.00000$:
$\mathrm{f(x)} = 2.410 \cdot (x - 3.000) + (-0.970)$

**Their graphs** in $\delta = 2.500$ coverage of the point $x_0 = 3.000$:




# 4 Conclusion

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