

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:

f(x) = (cos x)^3.000

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

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 M0(x0) = (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) · sin x

3 step: Finding a derivation of (cos x)^3.000

Never say it to girls:

((cos x)^3.000)' =

= 3.000 · (cos x)^2.000 · (-1.000) · sin x

Congratulations! The first derivation of the expression is:

f'(x) = 3.000 · (cos x)^2.000 · (-1.000) · sin x

In the point M0(x0) = (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::

$$(x)' = \dots = \text{[top secret]} = \dots = \\ = 1.000$$

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:

$$(-1.000)' = \dots = \text{[top secret]} = \dots = \\ = 0.000$$

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:

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

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

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:

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

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

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:

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

$$= 1.000$$

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

I have no words to describe this fact:

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

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

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:

$$\begin{aligned}(3.000 \cdot (\cos x)^{2.000})' &= \dots = \text{[top secret]} = \dots = \\ &= 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x\end{aligned}$$

6 step: Finding a derivation of x

You should be aware of the fact that:

$$\begin{aligned}(x)' &= \\ &= 1.000\end{aligned}$$

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

A true prince must know that:

$$\begin{aligned}(\cos x)' &= \\ &= (-1.000) \cdot \sin x\end{aligned}$$

8 step: Finding a derivation of -1.000

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

$$\begin{aligned}(-1.000)' &= \\ &= 0.000\end{aligned}$$

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:

$$\begin{aligned}((-1.000) \cdot \cos x)' &= \dots = \text{[top secret]} = \dots = \\ &= (-1.000) \cdot (-1.000) \cdot \sin x\end{aligned}$$

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

Never say it to girls:

$$\begin{aligned}((-1.000) \cdot \cos x \cdot 3.000 \cdot (\cos x)^{2.000})' &= \\ &= (-1.000) \cdot (-1.000) \cdot \sin x \cdot 3.000 \cdot (\cos x)^{2.000} + 3.000 \cdot 2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \cos x\end{aligned}$$

11 step: Finding a derivation of x

It's really easy to find:

$$\begin{aligned}(x)' &= \\ &= 1.000\end{aligned}$$

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

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

$$\begin{aligned}(\sin x)' &= \dots = \text{[top secret]} = \dots = \\ &= \cos x\end{aligned}$$

13 step: Finding a derivation of -1.000

Even my two-aged sister knows that:

$$\begin{aligned}(-1.000)' &= \\ &= 0.000\end{aligned}$$

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:

$$\begin{aligned} (x)' &= \dots = \text{[top secret]} = \dots = \\ &= 1.000 \end{aligned}$$

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

A true prince must know that:

$$\begin{aligned} (\sin x)' &= \dots = \text{[top secret]} = \dots = \\ &= \cos x \end{aligned}$$

17 step: Finding a derivation of -1.000

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

$$\begin{aligned} (-1.000)' &= \\ &= 0.000 \end{aligned}$$

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

Only by using special skills we might know::

$$\begin{aligned} ((-1.000) \cdot \sin x)' &= \dots = \text{[top secret]} = \dots = \\ &= (-1.000) \cdot \cos x \end{aligned}$$

19 step: Finding a derivation of x

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

$$\begin{aligned} (x)' &= \\ &= 1.000 \end{aligned}$$

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:

$$\begin{aligned} (\cos x)' &= \dots = \text{[top secret]} = \dots = \\ &= (-1.000) \cdot \sin x \end{aligned}$$

21 step: Finding a derivation of 2.000

My roommate mumbled it in his sleep all night:

$$\begin{aligned} (2.000)' &= \dots = \text{[top secret]} = \dots = \\ &= 0.000 \end{aligned}$$

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

A true prince must know that:

$$\begin{aligned} (2.000 \cdot \cos x)' &= \dots = \text{[top secret]} = \dots = \\ &= 2.000 \cdot (-1.000) \cdot \sin x \end{aligned}$$

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

A true prince must know that:

$$\begin{aligned} (2.000 \cdot \cos x \cdot (-1.000) \cdot \sin x)' &= \\ &= 2.000 \cdot (-1.000) \cdot \sin x \cdot (-1.000) \cdot \sin x + (-1.000) \cdot \cos x \cdot 2.000 \cdot \cos x \end{aligned}$$

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:

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

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:

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

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:

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

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 !!!**

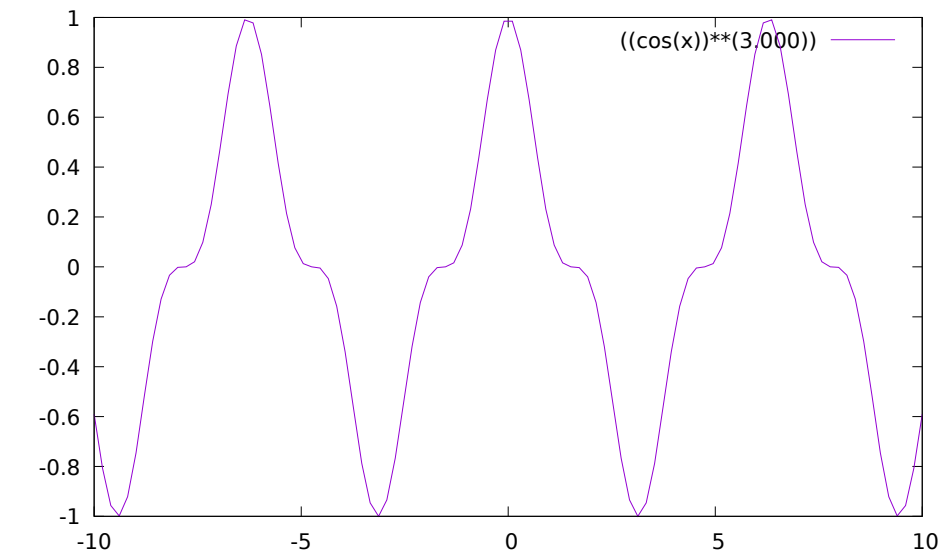
- **Decomposing on Macloren’s formula**

Maklorems formula for $x \rightarrow x_0 = 8.000$:

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

- **Graphics**

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

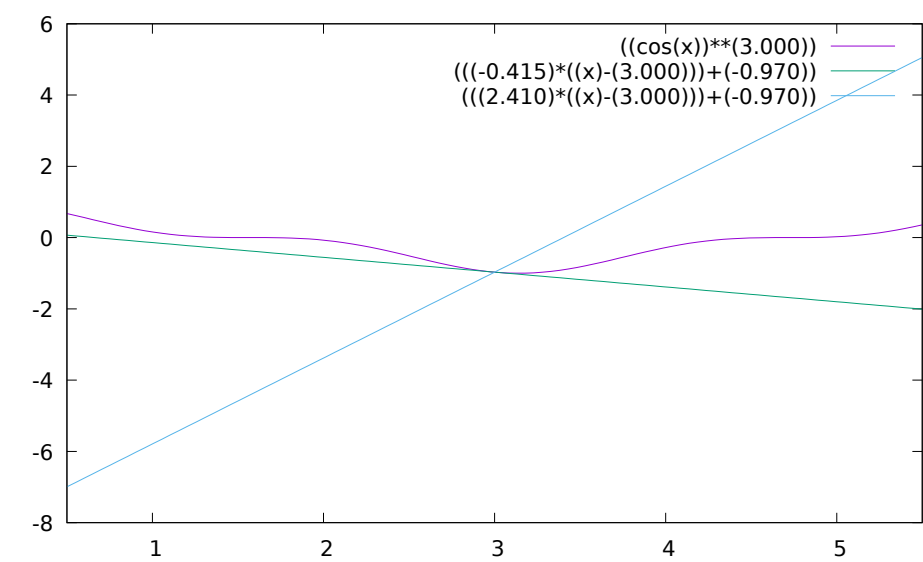


- Equations in the point

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

Normal equation in $x_0 = 3.000000$:
 $f(x) = 2.410 \cdot (x - 3.000) + (-0.970)$

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...