1 Introduction

$CrInGeCrInGeProduction.Supercringeintroductionhere:$

2 Some basic knowledge about researching problem...

Let's calculate smth with a given function: f(x, y) $= (\sin(x \cdot y))^{3.000}$

Firstly, let's simplify this expression (if possible): f(x, y) $= (\sin(x \cdot y))^{3.000}$

3 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 $M_0(x_0, y_0) = (3.142, 2.000)$ **it's value** = -0.00000

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 y

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

$(y)' = ... = [\text{top secret}] = ... =$

$= 1.000$

`2 step:` Finding a derivation of x

It's really easy to find:

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

$= 1.000$

`3 step:` Finding a derivation of $x \cdot y$

My roommate mumbled it in his sleep all night:

$(x \cdot y)' = ... = [\text{top secret}] = ... =$

$= y + x$

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

Sounds logical that it is the same as:

$(\sin(x \cdot y))' = ... = [\text{top secret}] = ... =$

$= \cos(x \cdot y) \cdot (y + x)$

`5 step:` Finding a derivation of $(\sin(x \cdot y))^{3.000}$

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

$((\sin(x \cdot y))^{3.000})' = ... = [\text{top secret}] = ... =$

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

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

f'(x, y) $= 3.000 \cdot (\sin(x \cdot y))^{2.000} \cdot \cos(x \cdot y) \cdot (y + x)$

In the point $M_0(x_0, y_0) = (3.142, 2.000)$ it's value = 0.00000

Finding the 1 derivation Let's find **the 1 derivation** of the expression:

`1 step:` Finding a derivation of y

Sounds logical that it is the same as:

$(y)' = ... = [\text{top secret}] = ... =$

$= 1.000$

`2 step:` Finding a derivation of x

It's really easy to find:

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

$= 1.000$

`3 step:` Finding a derivation of $x \cdot y$

My roommate mumbled it in his sleep all night:

$(x \cdot y)' = ... = [\text{top secret}] = ... =$

$= y + x$

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

What if:

$(\sin(x \cdot y))' = ... = [\text{top secret}] = ... =$

$= \cos(x \cdot y) \cdot (y + x)$

`5 step:` Finding a derivation of $(\sin(x \cdot y))^{3.000}$

It's really easy to find:

$((\sin(x \cdot y))^{3.000})' = ... = [\text{top secret}] = ... =$

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

Finally... The 1 derivation of the expression:

$f^{(1)}$(x, y) $= 3.000 \cdot (\sin(x \cdot y))^{2.000} \cdot \cos(x \cdot y) \cdot (y + x)$

BRITISH SCIENTISTS WERE SHOCKED AGAIN, WHEN THEY COUNT THE 1 DERIVATION OF THIS EXPRESSION!!!

In the point $M_0(x_0, y_0) = (3.142, 2.000)$ it's value = 0.00000

Finding partical derivations Partial derivation of the expression on the variable x:

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

In the point $M_0(x_0, y_0) = (3.142, 2.000)$ it's value = 0.00000 !!!

Partial derivation of the expression on the variable y:

$\frac{\partial f}{\partial y} = 3.000 \cdot (\sin(3.142 \cdot y))^{2.000} \cdot 3.142 \cdot \cos(3.142 \cdot y)$

In the point $M_0(x_0, y_0) = (3.142, 2.000)$ it's value = 0.00000 !!!

Finding full derivation Full derivation:

$\sqrt{(3.000 \cdot (\sin(2.000 \cdot x))^{2.000} \cdot 2.000 \cdot \cos(2.000 \cdot x))^{2.000} + (3.000 \cdot (\sin(3.142 \cdot y))^{2.000} \cdot 3.142 \cdot \cos(3.142 \cdot y))^{2.000}}$

In the point $M_0(x_0, y_0) = (3.142, 2.000)$ it's value = 0.00000 !!!

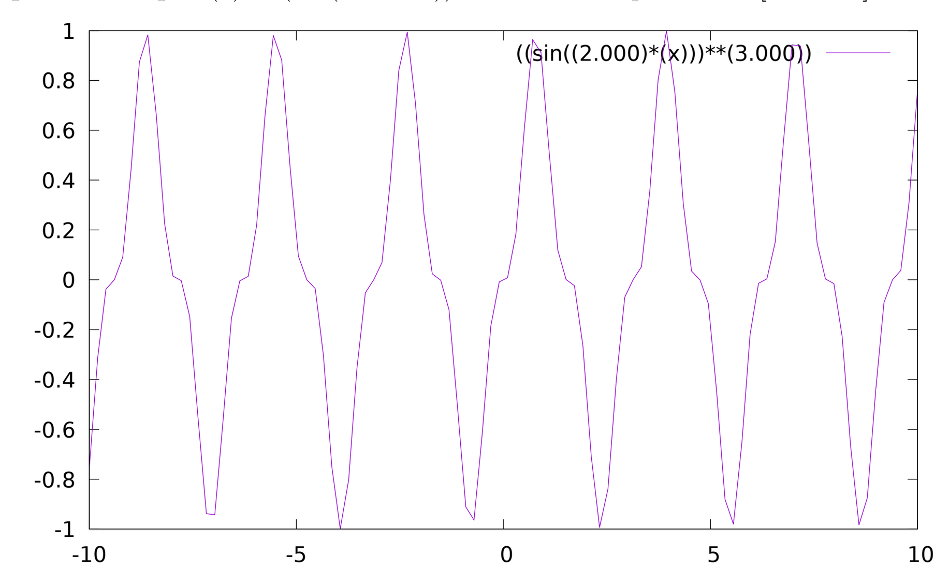
4 Exploration the expression as a function of the first variable

Now let's consider the expression as a function of x variable: f(x) $= (\sin(2.000 \cdot x))^{3.000}$

Decomposing on Macloren's formula **Maklorens formula for** $x \to x_0 = 3.142$:

f(x) $= (-0.000) + 0.000 \cdot (x - 3.142) + (-0.002) \cdot (x - 3.142)^{2.000} + 8.000 \cdot (x - 3.142)^{3.000} + 0.007 \cdot (x - 3.142)^{4.000} + o((x - 3.142)^{4.000})$

Graphics **Graph** f(x) $= (\sin(2.000 \cdot x))^{3.000}$ on the diapasone $x \in [-10 : 10]$:



Equations in the point **Tangent equation** in the point $x_0 = 1.000$:

f(x) $= (-2.064) \cdot (x - 1.000) + 0.752$

Normal equation in the point $x_0 = 1.000$:

f(x) $= 0.484 \cdot (x - 1.000) + 0.752$