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:
$(y)' = ... =$ [top secret] $= ... =$
$= 1.000$
`2 step:` Finding a derivation of x
It's really easy to find:
$(x)' = ... =$ [top secret] $= ... =$
$= 1.000$
`3 step:` Finding a derivation of $x \cdot y$
My roommate mumbled it in his sleep all night:
$(x \cdot y)' = ... =$ [top secret] $= ... =$
$= y + x$
`4 step:` Finding a derivation of $\sin(x \cdot y)$
Sounds logical that it is the same as:
$(\sin(x \cdot y))' = ... =$ [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:
$((\sin(x \cdot y))^{3.000})' = ... =$ [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:
$(y)' = ... =$ [top secret] $= ... =$
$= 1.000$
`2 step:` Finding a derivation of x
It's really easy to find:
$(x)' = ... =$ [top secret] $= ... =$
$= 1.000$
`3 step:` Finding a derivation of $x \cdot y$
My roommate mumbled it in his sleep all night:
$(x \cdot y)' = ... =$ [top secret] $= ... =$
$= y + x$
`4 step:` Finding a derivation of $\sin(x \cdot y)$
What if:
$(\sin(x \cdot y))' = ... =$ [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:
$((\sin(x \cdot y))^{3.000})' = ... =$ [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 !!!

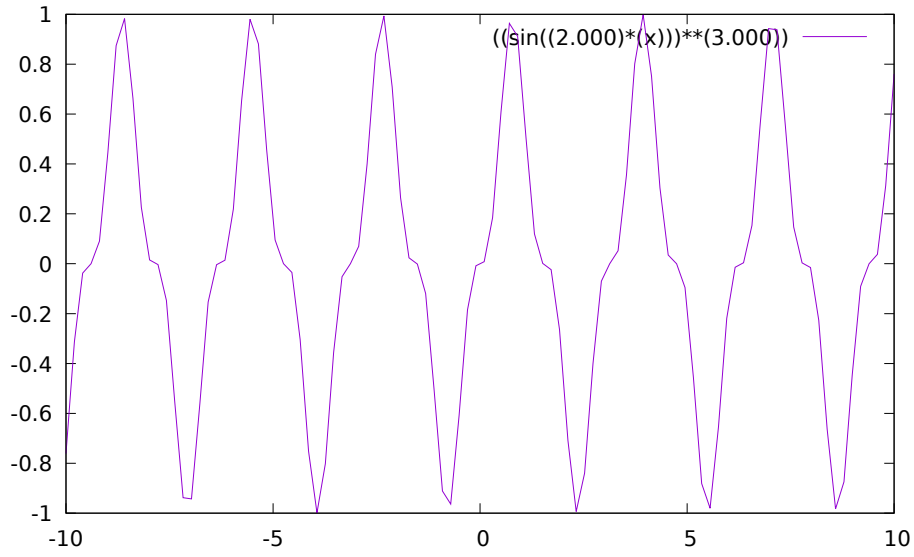
Finding full derivation Full derivation:
$\sqrt{(3.000 \cdot (\sin(2.000 \cdot x))^{2.000} \cdot 2.000 \cdot \cos(2.000 \cdot x))^{2.000} + (3.000 \cdot (\sin(3.142 \cdot y))^{2.000} \cdot 3.142 \cdot \cos(3.142 \cdot y))^{2.000}}$
In the point $M_0(x_0, y_0)$ = (3.142, 2.000) it's value = 0.00000 !!!

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



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

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

Normal equation in the point $x_0 = 1.000$:

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