1 Introduction

$CrInGeCrInGeProduction.Supercringeintroductionhere:$

Let's calculate smth with a given function: f(x, y) = $\sin x \cdot y^{2.000}$
Firstly, let's insert all constants and simplify this expression: f(x, y) = $\sin x \cdot y^{2.000}$

2 Exploration 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 $M_0(x_0, y_0) = (3.000, 2.000)$ **it's value** = 0.564
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:
$y^{2.000}$
It's really easy to find:
$(y^{2.000})' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot y$
3 step. finding a derivation of:
x
My roommate mumbled it in his sleep all night:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
4 step. finding a derivation of:
$\sin x$
Sounds logical that it is the same as:
$(\sin x)' = ... = [\text{top secret}] = ... =$
$= \cos x$
5 step. finding a derivation of:
$\sin x \cdot y^{2.000}$
For centuries, people have hunted for the secret knowledge that:
$(\sin x \cdot y^{2.000})' = ... = [\text{top secret}] = ... =$
$= \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot \sin x$
Congratulations! **The first derivation of the expression** is:
$\cos x \cdot y^{2.000} + 2.000 \cdot y \cdot \sin x$In the point $M_0(x_0, y_0) = (3.000, 2.000)$ it's value = -3.395

Finding the 3 derivation: Let's calculate the 3 derivation of the expression:
Calculating 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:
$y^{2.000}$
It's really easy to find:
$(y^{2.000})' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot y$
3 step. finding a derivation of:
x
My roommate mumbled it in his sleep all night:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
4 step. finding a derivation of:
$\sin x$
What if it equals:
$(\sin x)' = ... = [\text{top secret}] = ... =$
$= \cos x$
5 step. finding a derivation of:
$\sin x \cdot y^{2.000}$
It's really easy to find:
$(\sin x \cdot y^{2.000})' = ... = [\text{top secret}] = ... =$
$= \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot \sin x$
Calculating the 2 derivation of the expression:
1 step. finding a derivation of:
x
Even my two-aged sister knows that it equals:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
2 step. finding a derivation of:
$\sin x$
When I was child, my father always told me: "Remember, son:

$(\sin x)' = ... = [\text{top secret}] = ... =$
$= \cos x$
3 step. finding a derivation of:
y
I spend the hole of my life to find the answer and finally it's:
$(y)' = ... = [\text{top secret}] = ... =$
$= 1.000$
4 step. finding a derivation of:
2.000
Man... Just look:
$(2.000)' = ... = [\text{top secret}] = ... =$
$= 0.000$
5 step. finding a derivation of:
$2.000 \cdot y$
For centuries, people have hunted for the secret knowledge that:
$(2.000 \cdot y)' = ... = [\text{top secret}] = ... =$
$= 2.000$
6 step. finding a derivation of:
$2.000 \cdot y \cdot \sin x$
It's really easy to find:
$(2.000 \cdot y \cdot \sin x)' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot \sin x + \cos x \cdot 2.000 \cdot y$
7 step. finding a derivation of:
y
It's simple as fuck:
$(y)' = ... = [\text{top secret}] = ... =$
$= 1.000$
8 step. finding a derivation of:
$y^{2.000}$
thanks to the results of my colleagues' scientific work, I know that it equals:
$(y^{2.000})' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot y$
9 step. finding a derivation of:
x
When I was child, my father always told me: "Remember, son:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
10 step. finding a derivation of:
$\cos x$
It's really easy to find:
$(\cos x)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \sin x$
11 step. finding a derivation of:
$\cos x \cdot y^{2.000}$
I was asked not to tell anyone that:
$(\cos x \cdot y^{2.000})' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x$
12 step. finding a derivation of:
$\cos x \cdot y^{2.000} + 2.000 \cdot y \cdot \sin x$
For centuries, people have hunted for the secret knowledge that:
$(\cos x \cdot y^{2.000} + 2.000 \cdot y \cdot \sin x)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x + 2.000 \cdot \sin x + \cos x \cdot 2.000 \cdot y$
Calculating the 3 derivation of the expression:
1 step. finding a derivation of:
y
My roommate mumbled it in his sleep all night:
$(y)' = ... = [\text{top secret}] = ... =$
$= 1.000$
2 step. finding a derivation of:
2.000
What if it equals:
$(2.000)' = ... = [\text{top secret}] = ... =$
$= 0.000$
3 step. finding a derivation of:
$2.000 \cdot y$
Even my two-aged sister knows that it equals:
$(2.000 \cdot y)' = ... = [\text{top secret}] = ... =$
$= 2.000$
4 step. finding a derivation of:
x
I spend the hole of my life to find the answer and finally it's:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
5 step. finding a derivation of:
$\cos x$
Even my two-aged sister knows that it equals:
$(\cos x)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \sin x$

6 step. finding a derivation of:
$\cos x \cdot 2.000 \cdot y$
While preparing for exams, I learned a lot of new things, for example:
$(\cos x \cdot 2.000 \cdot y)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x$
7 step. finding a derivation of:
x
When I was child, my father always told me: "Remember, son:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
8 step. finding a derivation of:
$\sin x$
Sounds logical that it is the same as:
$(\sin x)' = ... = [\text{top secret}] = ... =$
$= \cos x$
9 step. finding a derivation of:
2.000
A true prince must know that it equals:
$(2.000)' = ... = [\text{top secret}] = ... =$
$= 0.000$
10 step. finding a derivation of:
$2.000 \cdot \sin x$
My roommate mumbled it in his sleep all night:
$(2.000 \cdot \sin x)' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot \cos x$
11 step. finding a derivation of:
$2.000 \cdot \sin x + \cos x \cdot 2.000 \cdot y$
My roommate mumbled it in his sleep all night:
$(2.000 \cdot \sin x + \cos x \cdot 2.000 \cdot y)' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x$
12 step. finding a derivation of:
x
If someone asked me that in the middle of the night, I wouldn't hesitate to say:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
13 step. finding a derivation of:
$\cos x$
A true prince must know that it equals:
$(\cos x)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \sin x$
14 step. finding a derivation of:
y
My roommate mumbled it in his sleep all night:
$(y)' = ... = [\text{top secret}] = ... =$
$= 1.000$
15 step. finding a derivation of:
2.000
While preparing for exams, I learned a lot of new things, for example:
$(2.000)' = ... = [\text{top secret}] = ... =$
$= 0.000$
16 step. finding a derivation of:
$2.000 \cdot y$
It's really easy to find:
$(2.000 \cdot y)' = ... = [\text{top secret}] = ... =$
$= 2.000$
17 step. finding a derivation of:
$2.000 \cdot y \cdot \cos x$
It's really easy to find:
$(2.000 \cdot y \cdot \cos x)' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y$
18 step. finding a derivation of:
y
When I was child, my father always told me: "Remember, son:
$(y)' = ... = [\text{top secret}] = ... =$
$= 1.000$
19 step. finding a derivation of:
$y^{2.000}$
What if it equals:
$(y^{2.000})' = ... = [\text{top secret}] = ... =$
$= 2.000 \cdot y$
20 step. finding a derivation of:
x
If someone asked me that in the middle of the night, I wouldn't hesitate to say:
$(x)' = ... = [\text{top secret}] = ... =$
$= 1.000$
21 step. finding a derivation of:
$\sin x$
thanks to the results of my colleagues' scientific work, I know that it equals:

$(\sin x)' = ... = [\text{top secret}] = ... =$
$= \cos x$
22 step. finding a derivation of:
(-1.000)
A true prince must know that it equals:
$((-1.000))' = ... = [\text{top secret}] = ... =$
$= 0.000$
23 step. finding a derivation of:
$(-1.000) \cdot \sin x$
A true prince must know that it equals:
$((-1.000) \cdot \sin x)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \cos x$
24 step. finding a derivation of:
$(-1.000) \cdot \sin x \cdot y^{2.000}$
When I was child, my father always told me: "Remember, son:
$((-1.000) \cdot \sin x \cdot y^{2.000})' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot (-1.000) \cdot \sin x$
25 step. finding a derivation of:
$(-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x$
For centuries, people have hunted for the secret knowledge that:
$((-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot (-1.000) \cdot \sin x + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y$
26 step. finding a derivation of:
$(-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x + 2.000 \cdot \sin x + \cos x \cdot 2.000 \cdot y$
A true prince must know that it equals:
$((-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x + 2.000 \cdot \sin x + \cos x \cdot 2.000 \cdot y)' = ... = [\text{top secret}] = ... =$
$= (-1.000) \cdot \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot (-1.000) \cdot \sin x + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x$
Finally... The 3 derivation of the expression:
$(-1.000) \cdot \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot (-1.000) \cdot \sin x + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x$
BRITISH SCIENTISTS WERE SHOCKED AGAIN, WHEN THEY COUNT THE 3 DERIVATION OF THIS EXPRESSION!!!
In the point $M_0(x_0, y_0) = (3.000, 2.000)$ it's value = -3.673

Finding partical derivations: Partial derivation of the expression on the variable x:
$\frac{\partial f}{\partial x} = 4.000 \cdot \cos x$
In the point $M_0(x_0, y_0) = (3.000, 2.000)$ it's value = -3.959970 !!!
Partial derivation of the expression on the variable y:
$\frac{\partial f}{\partial y} = 0.141 \cdot 2.000 \cdot y$
In the point $M_0(x_0, y_0) = (3.000, 2.000)$ it's value = 0.564480 !!!

Finding full derivation: Full derivation:
$\sqrt{(4.000 \cdot \cos x)^{2.000} + (0.141 \cdot 2.000 \cdot y)^{2.000}}$
In the point $M_0(x_0, y_0) = (3.000, 2.000)$ it's value = 4.000 !!!

3 Exploration the function of the first variable

Now let's consider the expression as a function of x variable: f(x) = $4.000 \cdot \sin x$
Maklorens formula for $x \to x_0 = 3.000$:
f(x) = $0.564 + (-3.960) \cdot (x - 3.000) + (-0.282) \cdot (x - 3.000)^{2.000} + 0.660 \cdot (x - 3.000)^{3.000} + 0.024 \cdot (x - 3.000)^{4.000}$+o$((x - 3.000)^{4.000})$
Graph f(x) = $4.000 \cdot \sin x$ on the diapasone $x \in [-10 : 10]$:

Tangent equation in the point $x_0 = 0.000$:
f(x) = $4.000 \cdot x$
Normal equation in the point $x_0 = 0.000$:
f(x) = $(-0.250) \cdot x$