

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:

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

= 1.000

2 step. finding a derivation of:

$y^{2.000}$

It's really easy to find:

$(y^{2.000})' = \dots = [\text{top secret}] = \dots =$

= $2.000 \cdot y$

3 step. finding a derivation of:

x

My roommate mumbled it in his sleep all night:

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

= 1.000

4 step. finding a derivation of:

$\sin x$

Sounds logical that it is the same as:

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

= $\cos x$

5 step. finding a derivation of:

$\sin x \cdot y^{2.000}$

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

$(\sin x \cdot y^{2.000})' = \dots = [\text{top secret}] = \dots =$

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

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:

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

= 1.000

2 step. finding a derivation of:

$y^{2.000}$

It's really easy to find:

$(y^{2.000})' = \dots = [\text{top secret}] = \dots =$

= $2.000 \cdot y$

3 step. finding a derivation of:

x

My roommate mumbled it in his sleep all night:

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

= 1.000

4 step. finding a derivation of:

$\sin x$

What if it equals:

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

= $\cos x$

5 step. finding a derivation of:

$\sin x \cdot y^{2.000}$

It's really easy to find:

$(\sin x \cdot y^{2.000})' = \dots = [\text{top secret}] = \dots =$

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

Calculating the 2 derivation of the expression:

1 step. finding a derivation of:

x

Even my two-aged sister knows that it equals:

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

= 1.000

2 step. finding a derivation of:

$\sin x$

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

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

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

$(\sin x)' = \dots = [\text{top secret}] = \dots =$
 $= \cos x$
 22 step. finding a derivation of:
 (-1.000)
 A true prince must know that it equals:
 $((-1.000))' = \dots = [\text{top secret}] = \dots =$
 $= 0.000$
 23 step. finding a derivation of:
 $(-1.000) \cdot \sin x$
 A true prince must know that it equals:
 $((-1.000) \cdot \sin x)' = \dots = [\text{top secret}] = \dots =$
 $= (-1.000) \cdot \cos x$
 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:
 $((-1.000) \cdot \sin x \cdot y^{2.000})' = \dots = [\text{top secret}] = \dots =$
 $= (-1.000) \cdot \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot (-1.000) \cdot \sin x$
 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:
 $((-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x)' = \dots = [\text{top secret}] = \dots =$
 $= (-1.000) \cdot \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot (-1.000) \cdot \sin x + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y$
 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:
 $((-1.000) \cdot \sin x \cdot y^{2.000} + 2.000 \cdot y \cdot \cos x + 2.000 \cdot \sin x + \cos x \cdot 2.000 \cdot y)' = \dots = [\text{top secret}] = \dots =$
 $= (-1.000) \cdot \cos x \cdot y^{2.000} + 2.000 \cdot y \cdot (-1.000) \cdot \sin x + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x$
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 partial 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 !!!

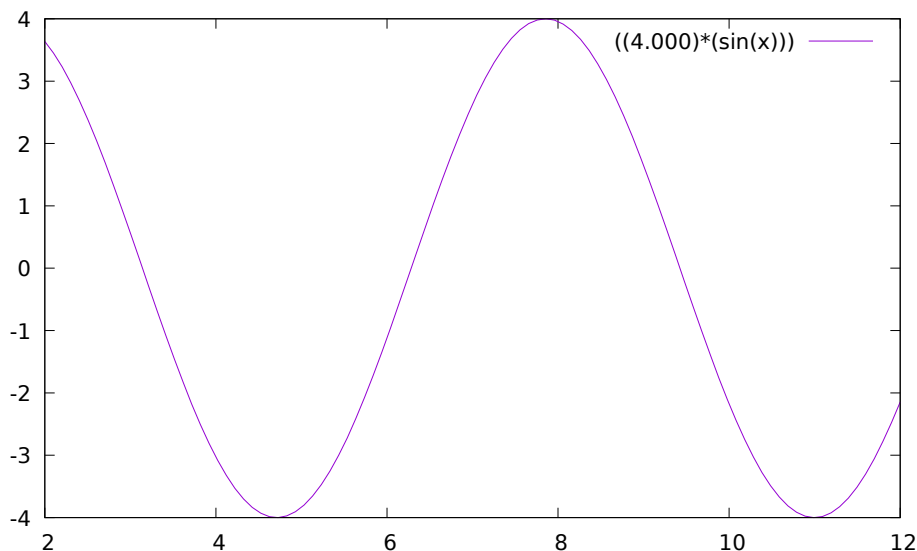
3 Exploration the function of the first variable

Now let's consider the expression as a function of x variable: $f(x) = 4.000 \cdot \sin x$

Maklorens formula for $x \rightarrow x_0 = 3.000$:

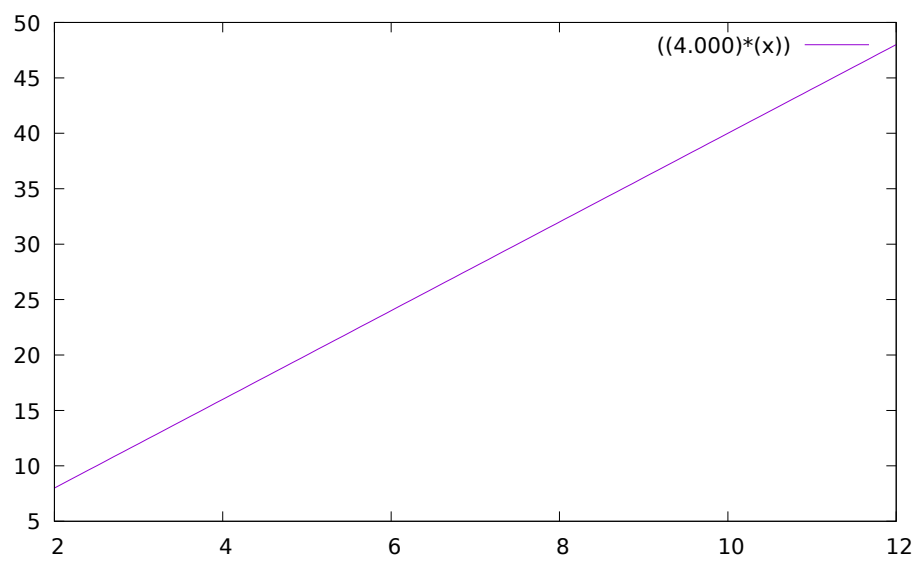
$$f(x) = 0.564 + (-3.960) \cdot (x - 3.000) + (-0.282) \cdot (x - 3.000)^{2.000} + 0.660 \cdot (x - 3.000)^{3.000} + 0.024 \cdot (x - 3.000)^{4.000} + o((x - 3.000)^{4.000})$$

Graph $f(x) = 4.000 \cdot \sin x$ on the diapason $x \in [2 : 12]$:



Tangent equation in the point $x_0 = 0.000$:

$$f(x) = 4.000 \cdot x$$



Normal equation in the point $x_0 = 0.000$:

$$f(x) = (-0.250) \cdot x$$

