

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 0 derivation:** Let’s calculate the 0 derivation of the expression:  
**Finally... The 0 derivation of the expression:**  
 $\sin x \cdot y^{2.000}$   
BRITISH SCIENTISTS WERE SHOCKED AGAIN, WHEN THEY COUNT THE 0 DERIVATION OF THIS EXPRESSION!!!  
In the point  $M_0(x_0, y_0) = (3.000, 2.000)$  it’s value = 0.564

**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**  $x \rightarrow x_0 = 3.000$ :  
 $f(x) = 0.564 + (-3.960) \cdot (x - 3.000) + (-0.282) \cdot (x - 3.000)^{2.000} + 0.660 \cdot (x - 3.000)^{3.000} + 0.024 \cdot (x - 3.000)^{4.000} + (-0.033) \cdot (x - 3.000)^{5.000} + o((x - 3.000)^6)$   
**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  $x_0 = 0.000$ :  
 $f(x) = (-0.250) \cdot x$