1 Introduction

CrInGeCrInGeProduction. Supercringeint roduction here:

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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}
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2 Exploration the expression as a function of multiple variables

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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:
   While preparing for exams, I learned a lot of new things, for example:
   (y)' = \dots = [\text{top secret}] = \dots =
   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:
   My roommate mumbled it in his sleep all night:
   (x)' = \dots = [\text{top secret}] = \dots =
= 1.000
   4 step. finding a derivation of:
   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 xIn 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:
   Sounds logical that it is the same as:
   (y)' = \dots = [\text{top secret}] = \dots =
= 1.000
   2 step. finding a derivation of:
   It's really easy to find:
   (y^{2.000})' = \dots = [\text{top secret}] = \dots =
= 2.000 \cdot y
   3 step. finding a derivation of:
   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:
   Even my two-aged sister knows that it equals:
   (x)' = \dots = [\text{top secret}] = \dots =
   2 step. finding a derivation of:
   When I was child, my father always told me: "Remember, son:
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(\sin x)' = \dots = [\text{top secret}] = \dots =
=\cos x
    3 step. finding a derivation of:
    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 =
    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:
    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:
    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:
    My roommate mumbled it in his sleep all night:
    (y)' = \dots = [\text{top secret}] = \dots =
= 1.000
    2 step. finding a derivation of:
    What if it equals:
    (2.000)' = \dots = [\text{top secret}] = \dots =
= 0.000
    3 step. finding a derivation of:
    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:
    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:
    Even my two-aged sister knows that it equals:
    (\cos x)' = \dots = [\text{top secret}] = \dots =
= (-1.000) \cdot \sin x
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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:
    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:
   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:
   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:
    My roommate mumbled it in his sleep all night:
   (y)' = \dots = [\text{top secret}] = \dots =
= 1.000
    15 step. finding a derivation of:
    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:
    When I was child, my father always told me: "Remember, son:
    (y)' = \dots = [\text{top secret}] = \dots =
   19 step. finding a derivation of: y^{2.000}
= 1.000
   What if it equals:
    (y^{2.000})' = \dots = [\text{top secret}] = \dots =
= 2.000 \cdot y
   20 step. finding a derivation of:
   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:
   thanks to the results of my colleagues' scientific work, I know that it equals:
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(\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 + (-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 + (-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 + (-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 
                  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 + (-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 + (-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 + (-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 + (-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 + (-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 + (-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 + (-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 + (-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 + (-1.000) \cdot \sin x \cdot 2.000 \cdot y + 2.000 \cdot \cos x + (-1.000) \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
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Finding partical derivations: Partial derivation of the expression on the variable x:

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\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 !!!
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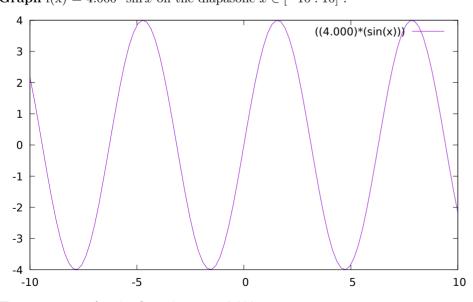
Finding full derivation: Full derivation:

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\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 $x_0 = 0.000$:

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