***CALCULATING A DERIVATIVE***

***Derivative from sum, product and quotient***

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| If each of the functions and has a derivative in point ,then the  и sum, difference, product и quotient of the functions and (in the case of a quotient it should be assumed that ), they also have a derivative in the point where the formulas apply: |

***Example1.*** СBy applying the rules mentioned above, we are now left with the possibility to calculate the derivative without any effort of any polynomial.. Using the following:

For example, for the following polynomial we have:

***Example2.*** By applying the rules mentioned above and the derivatives of some elementary functions, for the derivative of the *we have*:

***Example3.*** *By applying the rule for a derivative from a* quotient, for the derivative of the functionwe have:

***Derivative from a complex function***

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| If the function has a derivative in a fixed pont , and function has a derivative in the point , then the function has a derivative in the point while the following formula applies |

***Example4.*** In the case of the function , by adding the , we get that

Similar for the function , by adding , we get that

***Example 5.*** Calculate the derivative of the function

The given function we can write it in the following form , or , where and we get:

***Derivative from a inverse function***

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| For the function exists an inverse function in the surroundings of the point . If we have an existing derivative of the function in point and while ,then a derivative exists of the inverse function in the point and is equal to . |

***Example6.*** The function is inverse to the function .

***Example7.*** Function is inverse to the function , .

In the points и we can only discuss for a left, or right derivative of this function.

***Derivative from a implicitly defined function***

Lets assume that the values of two variables and are tied with the equation, .

If the function defined on a interval is such by replacing of with во we get the identity of , we say that is an implicit function set with the equation .

***Example 8.*** We have the following function .

If we get a derivative from both sides of the equation of , assuming that is a function of , we get the following:

from which it follows that

.

***Example9.*** We have the function .

If we get a derivative from both sides of the equation of , assuming that is a function of , we get the following:

from which it follows that

.

***Derivative from a parametrically defined function***

We have the following equations

(1)

Where takes values in the . For every value of the values и comply . If the obtained values и we interpret tem as coordinates in the coordinate plane , then for every value of corresponds a point in the plane. By that way, when changes from to , we get a curve in the plane. The equations(1) are called paсе нарекуваат parametric equations of that curve, is called a parameter, and the way of setting the curve is called а parametric.

If we assume that the function has an inverse function, ,

then is a function of , or

*.* (2)

That way the equations (1) define a function from , for which we say that its a given in a parameter way. The direct dependence is obtained by eliminating the parameter from equations (1).

Lets find a derivative from the function of given in a parameter way with the equations (1). We will assume that the functions and have a derivative in each inner point of the segment , while the function has an inverse of the segment at hand. Then the function defined with parameter equations (1) can be looked as a complex function.

where changes in the segmentс. Following the rule for a derivative from a complex function we find that:

.

Based on the derivative of the inverse function we have .

By the last equation we get

, or .

***Example10.*** Function from is given with the parametric equations:

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For the arbitrary value of parameter произволна of the given segment we have the following:

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***TASKS***

Find the derivative of the functions, if:

***1.  ***

**2.  **

**3.  **

**4. **

**5.  **

**6.  **

**7.  **

**8.  **

**9.  **

**10. **

**11.  **

**12.  **