




# On the use of GeoGebra for examining functions

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Ružica Vukobratović, Djurdjica Takači,

High School "Isidora Sekulić"  
Department of mathematics and informatics,  
Novi Sad, Serbia

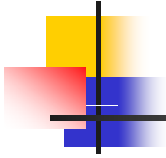


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**Calculus** is built on combining:  
**graphic, symbolic** and **analytic**  
representations of functions

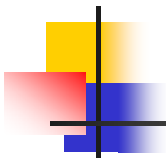
The **use of computer software** enables  
**graphic, symbolic**, and **numeric** interpretation.

Therefore the use of computer is one of the best tool in  
the teaching functions, and teaching functions is the  
best application of the appropriate packages.



We analyze the students work on the  
properties of  
logarithmic, exponential, and trigonometric  
functions by using the package *GeoGebra*.

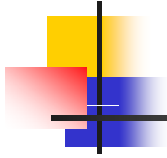
25 talented second grade students of  
high school in Serbia,  
16-17 years old  
were asked to do the following:



Questionnaire

Use the programme package *Geogebra*  
to show the properties of

1. logarithmic functions;
2. exponential functions;
3. trigonometric functions.



Almost all students tried to show that the logarithmic function,

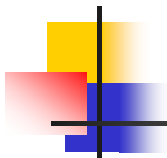
for example  $f(x) = \log_2 x$

can be obtained as the inverse function of the corresponding exponential function, as the reflected curve about the line

$$y = x$$

*By using GeoGebra*

the reflected (geometric) object about the line can be drawn, but in this case it had been imposible.



Therefore the students made different efforts to overcome these difficulties. We present the interesting *GeoGebra* students' work.

Mihajlo, considered the point on  $C$  on the graph of exponential function

$$y = 2^x$$

the line determined  $A(0,0)$  and  $B(2,2)$  and point  $E$ , reflected to the point  $B$  about the line determined with points  $A$  and  $B$ .

Including command *Trace On* on the point  $E$  and

moving point  $C$  along the curve representing graph of function  $y$ , he got the series of points corresponding to the graph of the corresponding logarithmic function.

[Radovi učenika\Mihailo - Inverzna funkcija-cc.ggb](#)



Move: Drag or select objects (Esc)

## Free Objects

 $f(x) = 2^x$ 

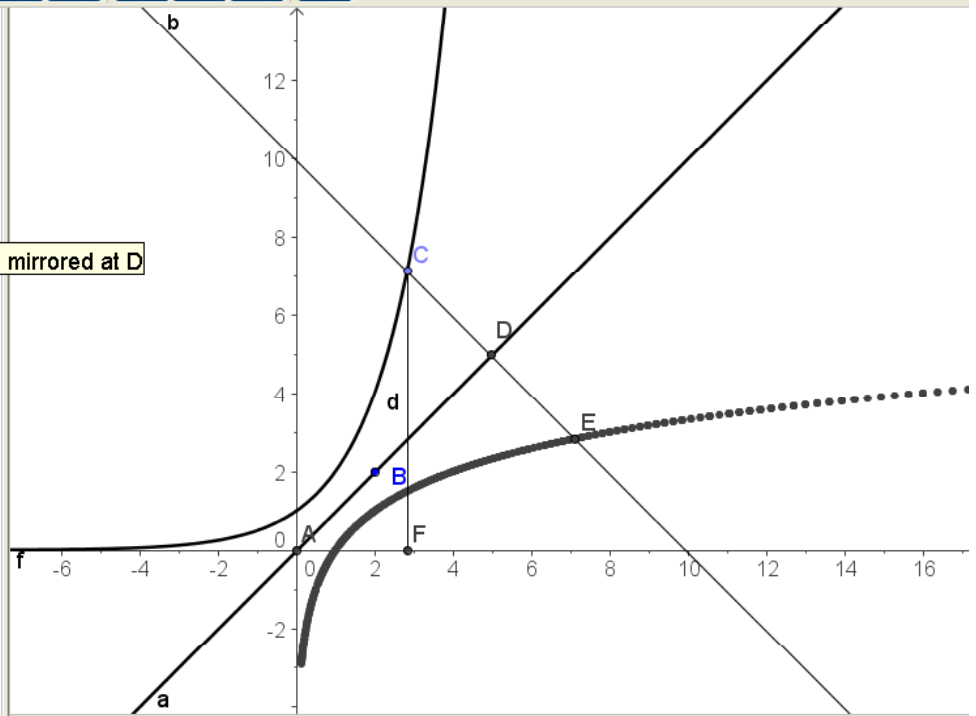
## Dependent Objects

 $A = (0, 0)$  $C = (2.83, 7.13)$  $D = (4.98, 4.98)$  $E = (7.13, 2.83)$  $F = (2.83, 0)$  $a: -x + y = 0$  $b: -2x - 2y = -19.92$  $c: x = 2.83$  $d = 7.13$ 

## Auxiliary Objects

 $B = (2, 2)$ 

Point E: C mirrored at D



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Play

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Input:

2

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Command ...



Microsoft PowerPoint ...

GeoGebra - Mihailo - I...

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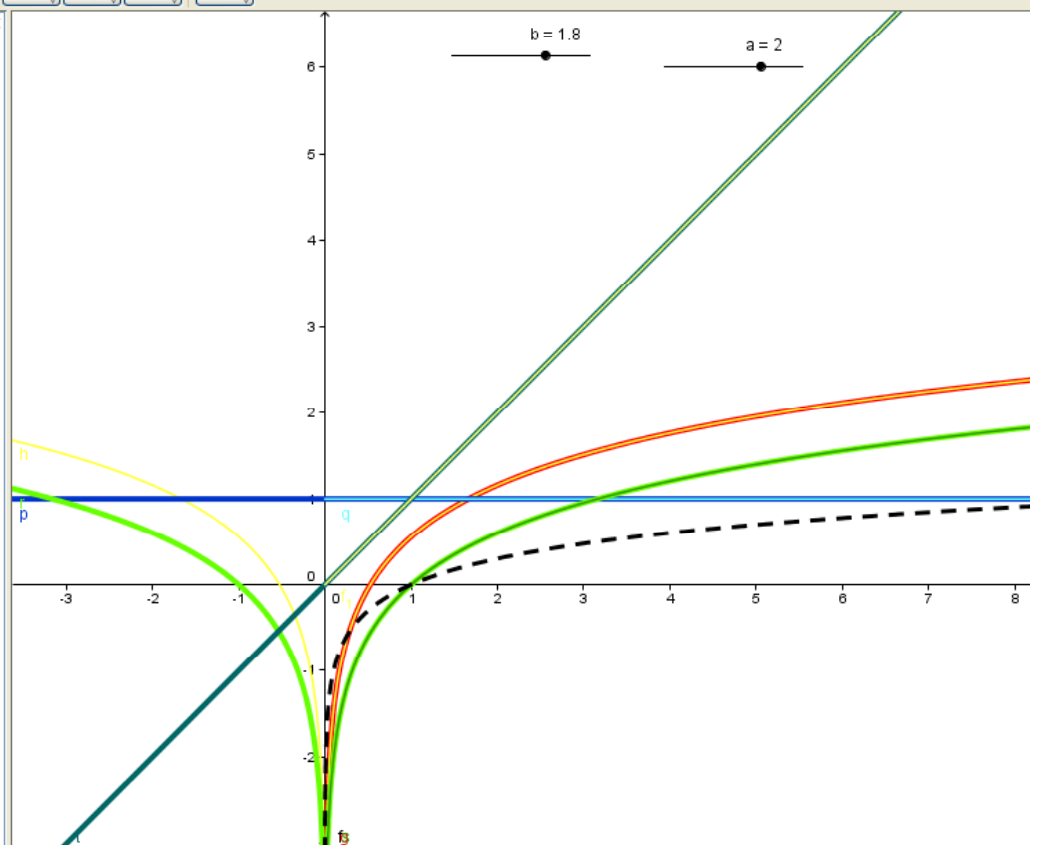
Pomeranje

Premestite ili izaberite objekte (Esc)

## nezavisni objekti

 $a = 2$  $b = 1.8$  $c = 5$  $d = 0.5$  $e = 2$  $f(x) = \lg(x)$  $f_1(x) = 10^{\lg(x)}$  $t(x) = x$ 

## zavisni objekti

 $g(x) = \lg(2x) + \lg(1.8x)$  $h(x) = \lg(2x \cdot 1.8x)$  $p(x) = \lg(5x / (0.5x))$  $q(x) = \lg(5x) - \lg(0.5x)$  $r(x) = \lg(x^2)$  $s(x) = 2 \lg(x)$ 

Unos:

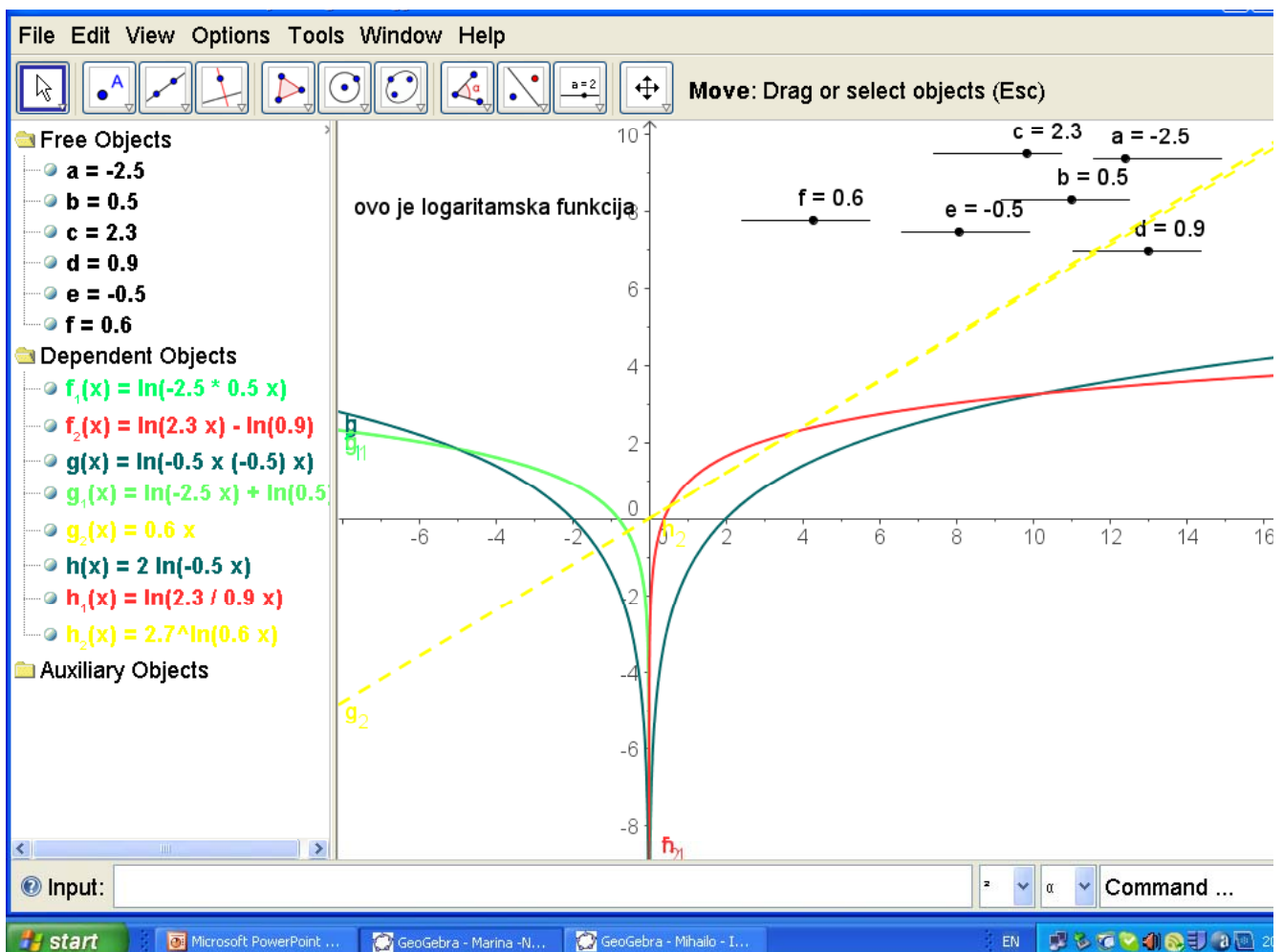
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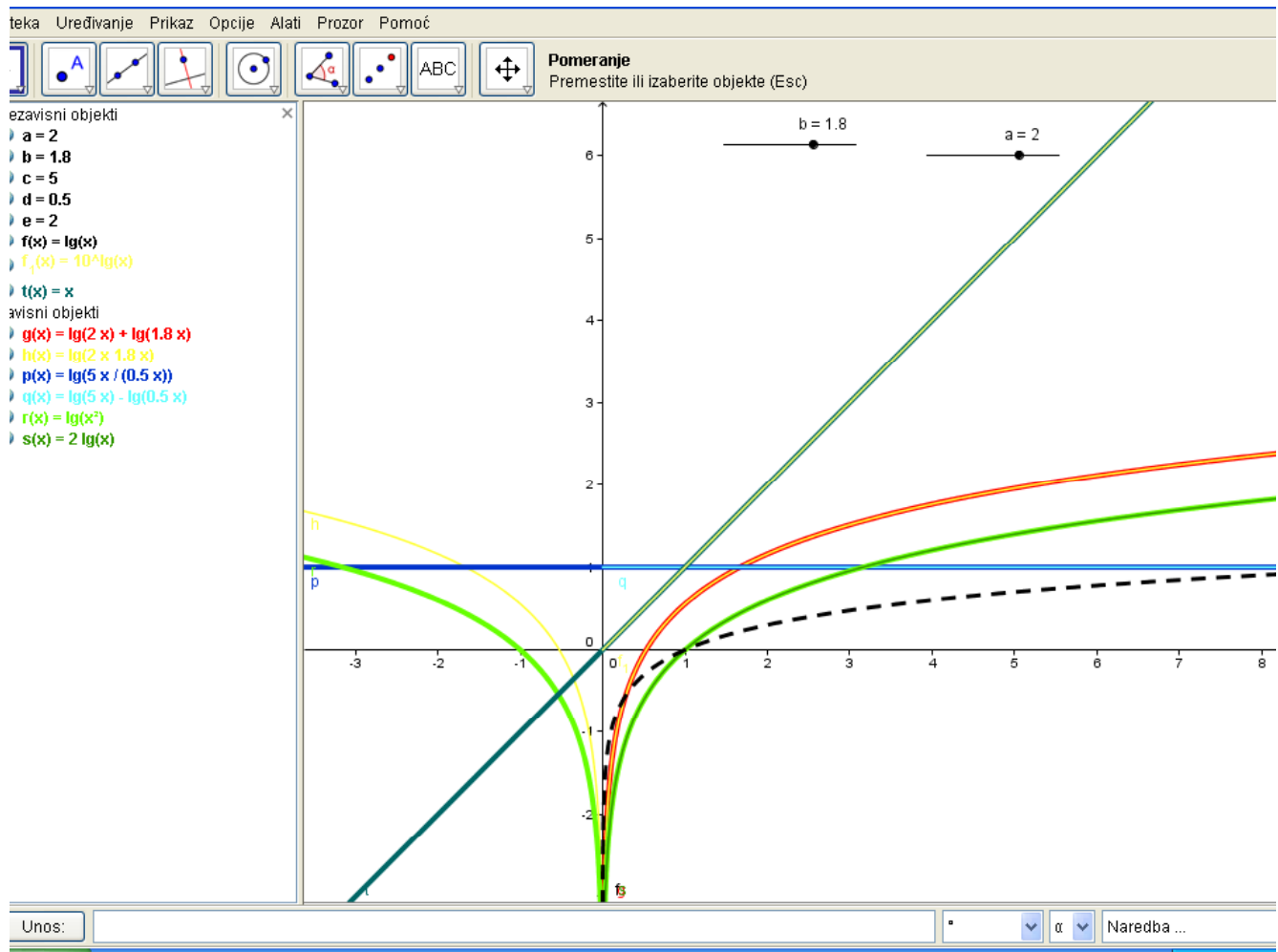
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Naredba ...

# On the properties of the logarithmic functions

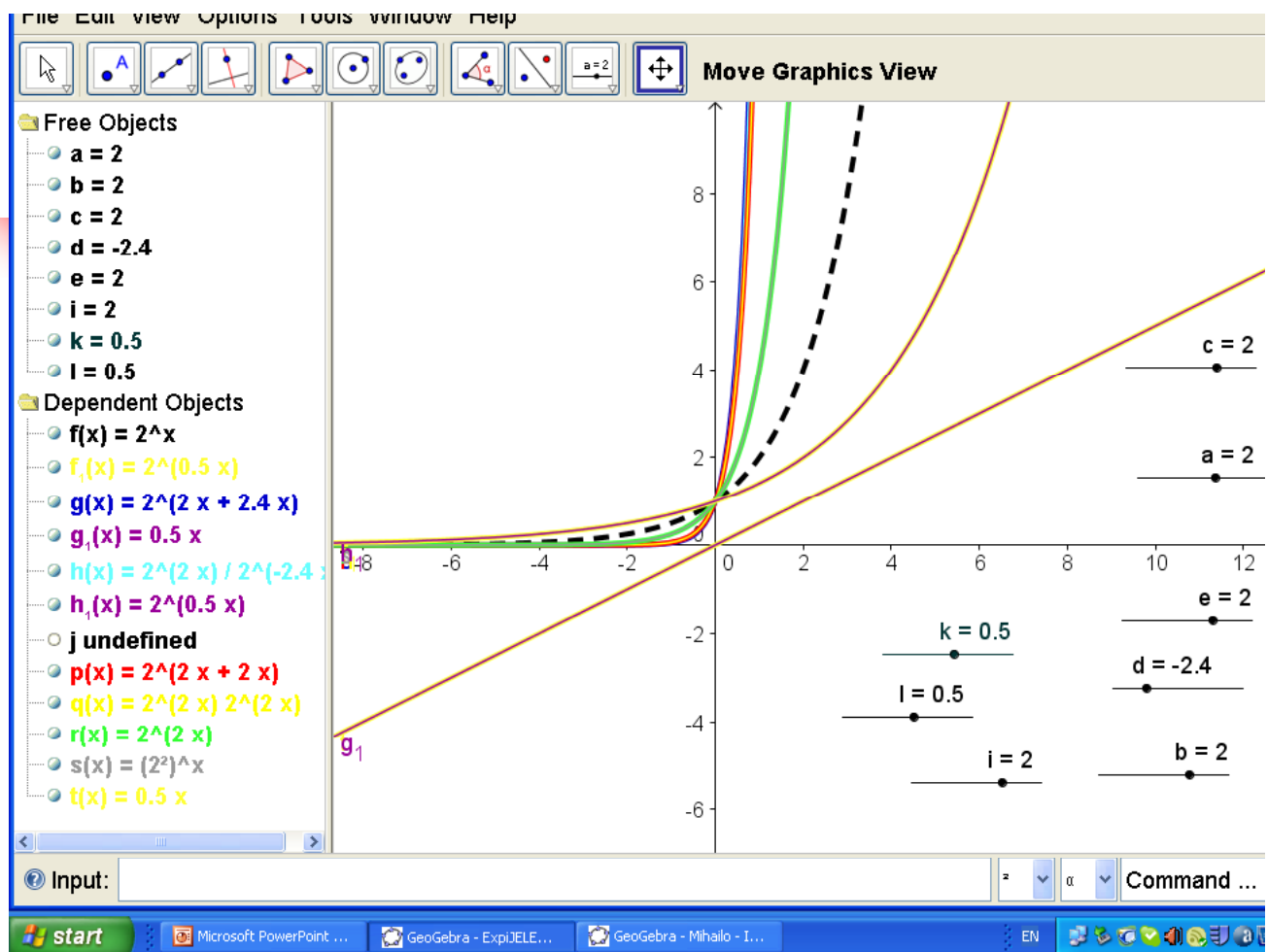
- The visualizations of the properties of the logarithmic functions Marina expressed by using sliders.
- [Marina -Neka svojstva logaritma.ggb](http://Marina-Neka-svojstva-logaritma.ggb)
- or





## On the properties of the exponential functions

- The visualizations of the properties of the exponential functions Marina expressed by using sliders.
- [ExpiJELENA.ggb](#)



Thanks for your atension