

Post-graduate students  
Mathematics: “Properties of Functions”

<b>Objective</b>	Skills to determine properties of functions using graphs of functions
<b>Learning environment</b>	College level math class
<b>Types of students</b>	College students
<b>Standards</b>	<ol style="list-style-type: none"> <li>1. Facilitate and Inspire Student Learning and Creativity</li> <li>2. Design and Develop Digital-Age Learning Experiences and Assessments</li> <li>3. Model Digital-Age Work and Learning</li> <li>4. Promote and Model Digital Citizenship and Responsibility</li> <li><b>5.</b> Engage in Professional Growth and Leadership</li> </ol>
<b>Materials</b>	Graph worksheet Problem sheet Set of Graphs
<b>Procedures</b>	<p>The function <math>y = f(x)</math> is given by its graph. Determine:</p> <ol style="list-style-type: none"> <li>1) domain of function</li> <li>2) range of function</li> <li>3) intervals of increase and decrease of function</li> <li>4) in what meanings <math>x</math>:             <ul style="list-style-type: none"> <li>• <math>f(x) = 0</math></li> <li>• <math>f(x) &gt; 0</math></li> <li>• <math>f(x) &lt; 0</math></li> <li>• <math>f(x) &lt; -1</math></li> </ul> </li> <li>5) The largest and smallest meanings of function.</li> <li>6) In that meanings:             <ul style="list-style-type: none"> <li>• <math>f'(x) &gt; 0</math></li> <li>• <math>f'(x) &lt; 0</math></li> <li>• <math>f'(x) = 0</math></li> <li>• <math>f'(x)</math> doesn't exist</li> </ul> </li> <li>7) extreme points</li> <li>8) extremes of function</li> <li>9) coordinates of points of graph in which tangents are parallel to axe of abscissas</li> </ol> <p>Answers to the questions</p>

- 1) domain of function  $D(f) = [-3 ; 6]$
- 2) range of function  $E(f) = [-5 ; 3,5]$
- 3) intervals of increase  $[1,5 ; 4]$   
intervals of decrease  $[-3 ; 1,5] \cup [4 ; 6]$

- 4)
  - $f(x) = 0$  at  $x = -2, x = 2,8, x = 5$
  - $f(x) > 0$   $[-3 ; -2) \cup (2,8 ; 5)$
  - $f(x) < 0$   $(-2 ; 2,8) \cup (5 ; 6]$
  - $f(x) < -1$   $(-0,5 ; 2,5) \cup (5,3 ; 6]$

5) the smallest meaning of function equals  $f(1,5) = -5$

the largest meaning of function equals  $f(3) = 3,5$

- 6)
  - $f'(x) > 0$  at the interval  $(1,5 ; 4)$
  - $f'(x) < 0$  at the intervals  $(-3 ; -1,5) \cup (-1,5 ; 1,5) \cup (4 ; 6)$
  - $f'(x) = 0$  when  $x = -1,5$  and  $x = 4$
  - $f'(x)$  doesn't exist when  $x = 1,5$

7) extreme point  $x = 4$

minimum point  $x = 1,5$

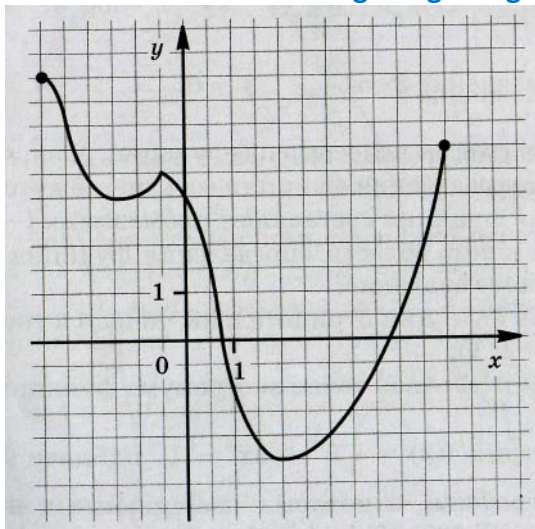
8) maximum of function  $f(4) = 1$

minimum of function  $f(1,5) = -5$

9) in points  $A(-1,5 ; -0,5)$  and  $B(4 ; 1)$  tangents to the given graph are parallel to the axe of axis's

## Application

. Fulfill the similar tasks using the given graphs



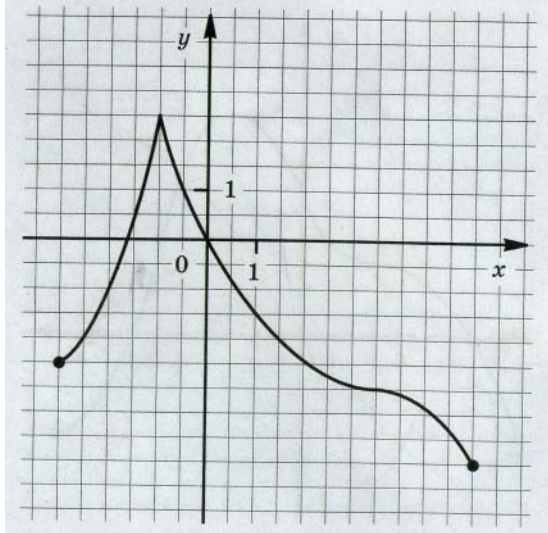


Fig2

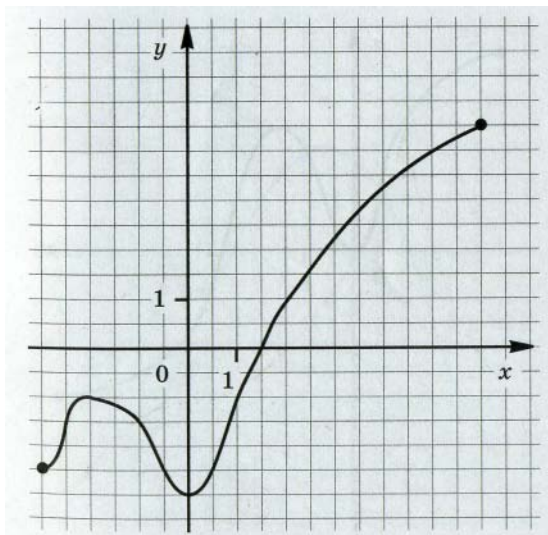


Fig3

## Evaluation

Students will be evaluated on the following:

- Understanding of graphing concept
- Application of tasks to graph figures
- Clear understanding of determined properties and functions