Problem1 **1 Point**

Which of the following represents a functional relation between x and y?

a) $4y^2 = 36 - 9x^2$ b) $3x = x^2 - y - 4$ c) $x^2 + y^2 = 4$ d) $x^2 + xy + y^2 = 8$

Problem 2 **2 Points**

Find the median of the data $18, k, 7, 12, 11, 22$, if it is known that the average of this data is 12.

a) 11,5 b) 12 c) 12,5 d) 13

Problem 3 **2 Points**

Find the equation of the tangent line to the graph of $f(x) = 1 - 2x^2 + x\ln x$ at $x = 2$.

a) $y = -7 + 2\ln 2 + (\ln 2 - 7)x$;

b) $y = -7 + 2\ln 2 - (\ln 2 - 7)(x - 2)$;

c) $y = 7 + (\ln 2 - 7)(x - 2)$;

d) $y = 7 + (\ln 2 - 7)x$.

Problem 4 **1 Point**

If $|x+y|<|x|+|y|$, then

a) $x\cdot y>0$ b) $x\cdot y<0$ c) $x<0$ and $y>0$ d) $x>0$ and $y<0$

Problem 5 **3 Points**

Find the set of values of the parameter a for which the system of linear equations
$\begin{cases}(a-2)x+y=-1\\3x+ay=1\end{cases}$ has infinitely many solutions.

a) $\{-1\}$ b) $\{3\}$ c) $\{-1;\,3\}$ d) $\{2\}$

Problem 6 **1 Point**

Find the domain of the function $f(x)=\dfrac{x-3}{\sqrt{x^2-9}}$.

a) $(3;+\infty)$;

b) $\mathbb{R}\setminus\{-3;\,3\}$;

c) $(-\infty;-3)\cup(3;+\infty)$;

d) $(-\infty;-3)$.

Problem 7 **2 Points**

Find $f'(0{,}5)$, if $f(x) = x \cdot \arcsin x$.

a) $\frac{\pi}{12}$ b) $\frac{\pi}{6} + \frac{\sqrt{3}}{3}$ c) $\frac{\pi}{3} - \frac{\sqrt{3}}{3}$ d) $\frac{\pi}{3}$

Problem 8 **2 Points**

Find the inverse function of $f(x) = \sqrt{x-3}$.

a) $g(x) = \frac{1}{\sqrt{x-3}}$

b) $g(x) = -\sqrt{x-3}$;

c) $g(x) = x^2 + 3,\ x \in [0; +\infty)$;

d) The function is not invertible.

Problem 9 **1 Point**

Which of the following is the equation of a line perpendicular to the line $y = 4x - 7$?

a) $y = \frac{1}{4}x - 7$ b) $y = -\frac{1}{4}x - 7$ c) $y = -4x + 3$ d) $y = 4x + 3$

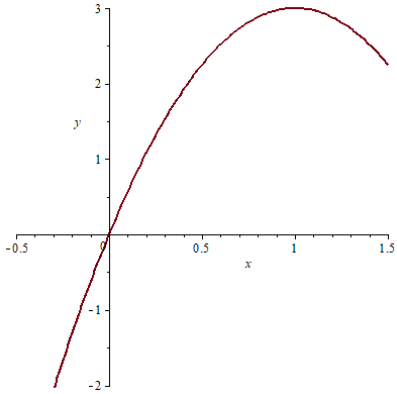
Problem 10 **2 Points**

Find the slope of the tangent line to the graph of $y=\sqrt{2x^2+1}$ at $x=2$.

a) 12 b) $\frac{4}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{2}$

Problem 11 **3 Points**

f is the twice differentiable function with a horizontal tangent line at a point $x=1$, as shown in the diagram on the right. Which of these statements must be true?



a) $f'(1)<f(1)<f''(1)$;
b) $f'(1)<f''(1)<f(1)$;
c) $f''(1)<f'(1)<f(1)$;
d) $f''(1)<f(1)<f'(1)$.

Problem 12 **2 Points**

The x-intercepts of a function $y=f(x)$ are 1; 3 and -4. Find the sum of x-intercepts of the function $y=f(x-5)$.

a) 15 b) -15 c) 0 d) 7.5

Problem 13 **2 Points**

Let f be the function defined on the set of all real numbers by the formula

$$f(x)=\begin{cases}\dfrac{x^2-6}{x-\sqrt{6}}, & if \quad x\neq\sqrt{6},\\ a-1, & if \quad x=\sqrt{6}.\end{cases}$$

For what value of a, the function f will be continues?

a) $-2\sqrt{6}$ b) $2\sqrt{6}-1$ c) $2\sqrt{6}$ d) $1+2\sqrt{6}$

Problem 14 **Point 1**

The matrix $\begin{pmatrix}1-a & 3\\ 2+a & -2\end{pmatrix}$ is invertible if and only if

a) $a\neq -8$ b) $a=-8$ c) $a\in\mathbb{Z}$ d) $a\neq -\frac{4}{5}$

Problem 15 **2 Points**

Two real numbers, x and y, are randomly chosen from the segment [0; 1]. Find the probability that one of them is more than twice the other.

a) $\frac{1}{4}$ b) $\frac{1}{3}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$

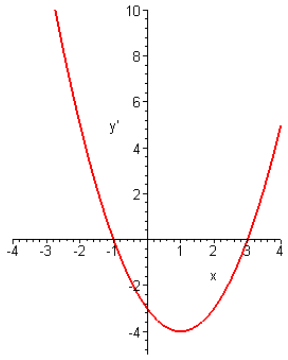
Problem 16 **2 Points**

When we roll a pair of balanced dice, what are the probabilities of getting 8 or 11 in sum?

a) $\frac{1}{18}$ b) $\frac{5}{36}$ c) $\frac{19}{36}$ d) $\frac{7}{36}$

Problem 17 **3 Points**

If the graph on the right is the graph of $y' = f'(x)$. Which of the following statements about function f is true?



a) Local minima point is $x = 1$ and no local maxima point.
b) Local maxima point is $x = -2,5$; local minima point is $x = 1$.
c) Local minima point is $x = 3$; local maxima point is $x = -1$; inflection point is $x = 1$.
d) Local minima point is $x = 1$; no local maxima point; inflection points are $x = -1$ and $x = 3$.

Problem 18 **2 Points**

Find the sum of parameters $a + b$, if it is known that the function $f(x) = \frac{bx^2 + 14x + 6}{x^2 + a}$ has one horizontal asymptote $y = 4$ and one vertical asymptote $x = 3$.

a) -2 b) 5 c) 7 d) -5

Problem 19 **3 Points**

Find the absolute maximum and absolute minimum of $f(x)=\frac{x^3}{3}-3x^2+5x+13$ on the interval $[0;\ 2]$.

a) $f_{\min}=13;\ f_{\max}=\frac{46}{3};$

b) $f_{\min}=13;\ f_{\max}=\frac{41}{3};$

c) $f_{\min}=\frac{41}{3};\ f_{\max}=\frac{46}{3};$

d) $f_{\min}=-3;\ f_{\max}=13.$

Problem 20 **3 Points**

Find the set of inflection points of the function $f(x)=x^5+\frac{5}{3}x^4-2x+3$?

a) $\{0\}$ b) $\{-1;\ 0\}$ c) $\left\{-\frac{4}{3}\right\}$ d) $\{-1\}$