

Problem 1**1 Point**

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

- a) $(-\infty; +\infty)$
- b) $(-\infty; -3) \cup (-3; +\infty)$
- c) $(-\infty; 3) \cup (3; +\infty)$
- d) $(-3; 3)$

Problem 2**1 Point**

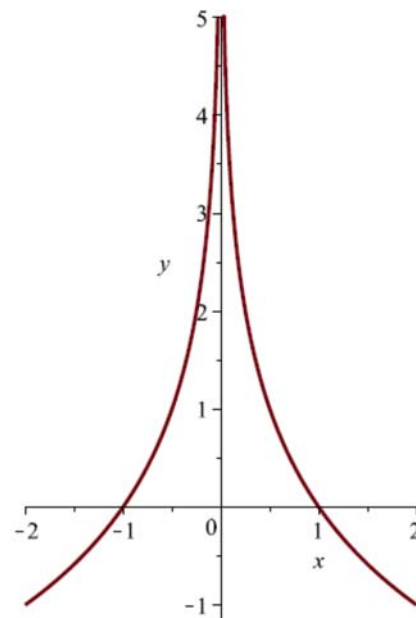
Find the slope of a tangent line to the graph of the function $f(x) = x \ln x$ at point $(e; e)$.

- a) e
- b) 2
- c) $\frac{1}{e}$
- d) $1 + \frac{1}{e}$

Problem 3**1 Point**

On the picture is depicted a graph of one from the below given functions. Find this function.

- a) $y = \log_{0.5} |x|$;
- b) $y = \frac{6}{|x|} - 6$;
- c) $y = 0.5^{|x|}$;
- d) $y = \frac{1}{\log_{0.5} |1-x|}$.



Problem 4**2 Points**

Find the equation of tangent line to the graph of the function $f(x) = 2^x$ at point $(2; 4)$.

- a) $y = -4x + 12$
- b) $y = 4x - 4$
- c) $y = 2 \ln 2 \cdot x + 4 - 4 \ln 2$
- d) $y = 4 \ln 2 \cdot x + 4 - 8 \ln 2$

Problem 5**2 Points**

In an inequality $a \geq b$ the variables a and b are replaced by randomly selected single-digit natural numbers. Find the probability that the resulting inequality is correct.

- a) $\frac{2}{3}$
- b) $\frac{4}{9}$
- c) $\frac{1}{2}$
- d) $\frac{5}{9}$

Problem 6**2 Points**

Find the limit

$$\lim_{n \rightarrow \infty} \left(1 + \frac{3}{n}\right)^{2n}.$$

a) 1

b) e c) e^6 d) $\sqrt[3]{e^2}$ **Problem 7****2 Points**Find the oblique asymptote of the function $f(x) = 2x + \frac{3x-5}{x}$.a) $y = 2x$ b) $y = 3x - 5$ c) $y = 2x + 3$

d) Doesn't exist.

Problem 8**1 Point**Find the median of the data: $-1; 5; x; 10; 9; 6$, if it is known that the mode of the data is 9 .

a) 7.5

b) 5.5

c) 6

d) 9

Problem 9**2 Points**

Find the minimal value of the function $f(x) = |x^2 + x + 1| + x + 2$.

- a) 0.5
- b) 1
- c) 1,5
- d) 2

Problem 10**2 Points**

The rational function $R(x) = \frac{3x^2 - 12}{x^2 + 3x - 10}$ has a

- a) vertical asymptote at $x = -5$ and horizontal asymptote $y = 3$;
- b) vertical asymptote at $x = -5$ and no horizontal asymptote;
- c) vertical asymptotes at $x = 2$ and $x = -5$ and no horizontal asymptote;
- d) vertical asymptotes at $x = 2$ and $x = -5$ and horizontal asymptote $y = 3$.

Problem 11**2 Points**

$$\lim_{x \rightarrow 0} \frac{x}{\sqrt{1+x} - \sqrt{1-x}} =$$

a) 1

b) 0

c) $-\infty$ d) $+\infty$ **Problem 12****Point 1**

Find $f'(-1)$, if the function f is defined by formula $f(x) = 3e^{2x^3}$.

a) $\frac{3}{e^2}$ b) $3e^2$ c) $\frac{1}{3}$ d) $\frac{18}{e^2}$

Problem 13**2 Points**

For what value(s) of parameter k the system $\begin{pmatrix} 4-k & 3+k \\ 3 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ has infinitely many solutions?

a) $-\frac{1}{5}$

b) -3

c) 4

d) $\{-3; 4\}$

Problem 14**2 Points**

Find the range of the function $f(x) = x^2 - 2x + 1$ if $x \in [-2; 3)$.

a) $(4; 9]$

b) $[0; 9]$

c) $[0; 9)$

d) $[4; 9]$

Problem 15**2 Points**

Find the interval(s) where $f(x) = \frac{e^{2x}}{x}$ is increasing.

- a) $(-\infty; 0.5)$ b) $(-\infty; 0)$ and $(0; 0.5)$ c) $(0.5; +\infty)$ d) $(-\infty; +\infty)$

Problem 16**3 Points**

Find the equation of the curve which is the image of the parabola $y = 2x^2 - x$ in Oxy Cartesian coordinate system with respect the parallel translation defined by the vector $\vec{P}(-3; 5)$.

- a) $y = 2x^2 - 13x + 16$;
b) $y = 2x^2 + 11x + 24$;
c) $y = 2x^2 - x + 2$;
d) $y = 2x^2 + 11x + 20$.

Problem 17**3 Points**

Find absolute maximum of the function $f(x) = x^3 - 15x + 5$ on the interval $(-\infty; 3)$.

- a) $f_{abs\ max} = 5 - 10\sqrt{5}$;
- b) $f_{abs\ max} = -13$;
- c) $f_{abs\ max} = 5 + 10\sqrt{5}$;
- d) $f_{abs\ max}$ doesn't exist.

Problem 18**3 Points**

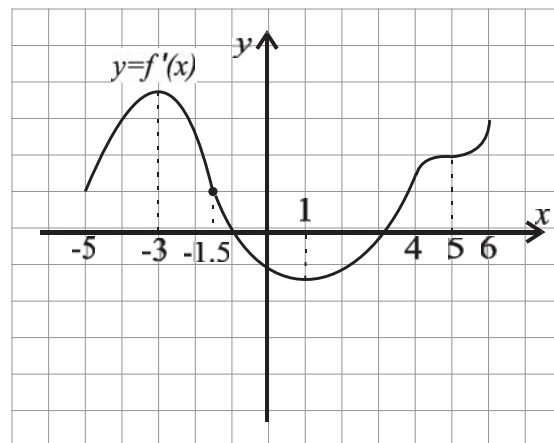
Find $p + q$, if it's known that the tangent line to the graph of the function $f(x) = x^3 + px + q$ at point $x = 2$ is defined by $y = -3x + 1$.

- a) -15
- b) 2
- c) 17
- d) 32

Problem 19**3 Points**

On the picture is depicted the graph of the **derivative** of a function $y = f(x)$ defined on the interval $(-5; 6)$.

Find the inflection points for $f(x)$.



a) $\{-1.5\}$

b) $\{-3; 1\}$

c) $\{-3; 1; 5\}$

d) $\{-1.5; 5\}$

Problem 20**3 Points**

Find b , if it is known that the function $f(x) = \begin{cases} x+3, & \text{if } x < 3 \\ ax^2 + bx, & \text{if } x \geq 3 \end{cases}$ is differentiable, where a and b are parameters.

a) $-\frac{1}{3}$

b) 3

c) $\frac{8}{3}$

d) 1