
Problem 1**1 Point**

Which function listed below is not odd?

- a) $f(x) = \sin(x^5)$
- b) $f(x) = e^x - e^{-x}$
- c) $f(x) = x|x|$
- d) $f(x) = \cos(x^5)$

Problem 2**1 Point**Find the range of the function $f(x) = 5 + \sqrt{x-2}$.

- a) $[5; +\infty)$
- b) $[0; +\infty)$
- c) $(-\infty; +\infty)$
- d) $[2; +\infty)$

Problem 3**1 Point**

Which of the following functions is even?

- a) $y = \log_{0.5} x$;
- b) $y = \frac{1}{x}$;
- c) $y = |\sin x|$;
- d) $y = 2^x$.

Problem 4**2 Points**

If $f: R \rightarrow R$ is a function continuous at point c and $g: R \rightarrow R$ is a function discontinuous at the same point c , then which of the following statements is always true?

- a) The product function $f \cdot g$ is continuous at c .
- b) The product function $f \cdot g$ is discontinuous at c .
- c) The sum function $f + g$ is continuous at c .
- d) The sum function $f + g$ is discontinuous at c .

Problem 5**2 Points**

A six-sided standard die with the numbers 1, 2, 3, 4, 5, 6 on the faces is thrown and the numbers on the five visible faces are added. What is the probability that this sum is a prime number?

- a) $\frac{1}{3}$
- b) $\frac{1}{6}$
- c) $\frac{5}{81}$
- d) $\frac{3}{25}$

Problem 6**2 Points**

Find the limit

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

a) 1

b) e c) e^6 d) e^3

Problem 7**2 Points**Find a point on the graph of the function $f(x) = 3e^{2x}$, where the tangent line to the graph is parallel to the line $y = 3x - 1$.a) $\left(-\ln \sqrt{2}; \frac{3}{2}\right)$ b) $(0; 3)$ c) $\left(-0.5; \frac{3}{e}\right)$ d) $(1; 3e^2)$

Problem 8**1 Point**Find all possible values for x such that the range of the data: $-1; 5; 2x - 1; 10; 6$ is 11.a) $\left[0; \frac{11}{2}\right]$ b) $[2; 5]$ c) $\left[\frac{11}{2}; +\infty\right)$ d) $[0; 11]$

Problem 9**2 Points**

Find the minimal value of the function $f(x) = 3 + \sqrt{x-3} + \sqrt{x-5}$.

- a) 3
- b) 4
- c) $4 + \sqrt{2}$
- d) $3 + \sqrt{2}$

Problem 10**2 Points**

Find the sum of the parameters b and c if for them, the rational function $R(x) = \frac{x^3 + bx + c}{(x-1)(x-3)}$ does not have vertical asymptotes.

- a) -25;
- b) -1;
- c) 1;
- d) 10

Problem 11**2 Points**

$$\lim_{x \rightarrow 0} \frac{(1+x)^{10} - 1}{x} =$$

- a) 1 b) 0 c) $+\infty$ d) 10

Problem 12**Point 1**

Find the oblique asymptote of the function $f(x) = x + \frac{-5x^2 + 3x - 5}{x}$.

- a) $y = x + 3$ b) $y = -5x + 3$ c) $y = -4x + 3$ d) Doesn't exist.

Problem 13**2 Points**

Find all values of parameter k for which the system $\begin{pmatrix} 4-k & 3 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ does not have solution.

- a) 4 b) $\frac{5}{2}$ c) $\frac{3}{2}$ d) {2.5; 4}

Problem 14**2 Points**

Which of the following statements is always true if A, B, C are arbitrary $n \times n$ matrices and C is invertible?

- a) $AB + C = BA + C$;
b) If $AB = 0$, then either $A = 0$ or $B = 0$;
c) $ABC = 0$, then $AB = 0$;
d) If $CB = AC$, then $B = A$.

Problem 15**2 Points**

Find the interval(s) where $f(x) = \frac{\ln x}{x}$ is decreasing.

a) $(0; e)$

b) $(-\infty; +\infty)$

c) $(e; +\infty)$

d) $(0; +\infty)$

Problem 16**3 Points**

Let f be the function defined by the formula

$$f(x) = \begin{cases} -a + \sqrt[3]{b+x}, & \text{if } x > 0 \\ 3, & \text{if } x = 0 \\ x^3 + a(x-1), & \text{if } x < 0 \end{cases}$$

Find the sum of parameters a and b for which f is continuous.

a) -3

b) 2

c) 3

d) 0

Problem 17**3 Points**Find all inflection points for the function $f(x) = x^4 - 24x^2 + 11$.

- a) $\{2\}$;
- b) $\{-2\}$;
- c) $\{-2; 2\}$;
- d) doesn't exist.

Problem 18**3 Points**Find $\frac{q}{p}$, if it's known that the tangent line to the graph of the function $f(x) = x^3 + 3px + q$ at point $x = -2$ is defined by the equation $y = px + 2q$.

- a) $-\frac{11}{6}$
- b) $-\frac{8}{3}$
- c) $\frac{1}{2}$
- d) 2

Problem 19

3 Points

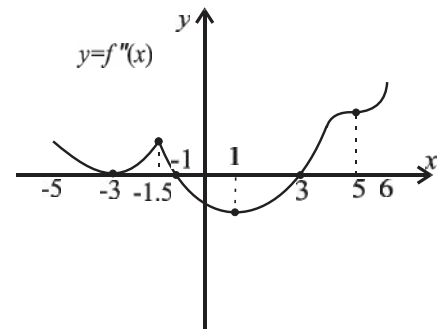
Determine absolute maximum and absolute minimum for the function $f(x) = 2x^3 - 3x^2 + 5$ within the interval $[-1; 3]$.

- a) 5; 0 b) 32; 0 c) 4; -1 d) 4; 0

Problem 20

3 Points

On the picture is depicted the graph of the second order derivative of a function $y = f(x)$ defined on the interval $(-5; 6)$. Find the inflection points for $f(x)$.



- a) $\{-3; -1.5; 1; 5\}$ b) $\{-1; 3\}$ c) $\{-3; 1; 5\}$ d) $\{-3; 1; 3\}$

