Test 1 MT01: specimen 1 of 4

Otázka 1 (4 b.) Calculate $\lim\limits_{x\to+\infty} \dfrac{x^2 \cdot \mathrm{e}^{-1/x}}{1-3x^2}$.

a) $-\frac{1}{3}$ b) $\frac{1}{3}$ c) 0 d) $+\infty$ e) $-\infty$

Question 2 (4 p.) Function $f(x) = x - 4 \cdot \sqrt{x} + 5$ on the interval $\langle 1, 9\rangle$ has its global minimum

a) at the point 1 b) at the point 2

c) at the point 4 d) at the point 9

e) nowhere

Otázka 3 (4 b.) A point of inflection to the graph of the function $f(x) = x^5 + 5x - 6$ is the point

a) $[0,0]$ b) $[1,1]$ c) $[1,2]$ d) $[0,6]$ e) $[0,-6]$

Otázka 4 (8 b.) Calculate $\lim\limits_{n\to\infty} \left[\sqrt{n} \cdot (\sqrt{n^4+2n} - \sqrt{n^4-2n})\right]$.

a) 1 b) $\frac{1}{2}$ c) 0 d) 2 e) $+\infty$

[Correct answers: a – c – e – c]

Test 1 MT01: specimen 2 of 4

Question 1 (4 p.) Function $f(x) = \sin^2 x$ on the interval $\left(\frac{1}{4}\pi, \pi\right)$ has its global maximum at the point

a) nowhere

b) at the point $\frac{1}{2}\pi$

c) at the point $\frac{1}{3}\pi$

d) at the point $\frac{3}{4}\pi$

e) at the point $\frac{2}{3}\pi$

Otázka 2 (4 b.) The slope of the normal to the graph of the function $f(x) = \arccos 3x$ at the intersection of the graph with the y-axis is equal to

a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{4}$ d) $\frac{1}{5}$ e) $\frac{1}{6}$

Otázka 3 (4 b.) Calculate $\lim\limits_{n\to\infty} \dfrac{n^2(n+1)-1}{1+3n-1000n^2}$.

a) 0 b) -1 c) $-\frac{1}{1000}$ d) $\frac{1}{1000}$ e) $-\infty$

Question 4 (8 p.) The derivative of the function $f(x) = \ln\left(x + \sqrt{a^2+x^2}\right)$ is the function

a) $f'(x) = \dfrac{1}{\sqrt{a^2+x^2}}$

b) $f'(x) = \dfrac{a}{\sqrt{a^2+x^2}}$

c) $f'(x) = \dfrac{a^2}{\sqrt{a^2+x^2}}$

d) $f'(x) = \dfrac{a^2+1}{\sqrt{a^2+x^2}}$

e) $f'(x) = \dfrac{a+2x}{\sqrt{a^2+x^2}}$

[Correct answers: b – b – e – a]

Test 1 MT01: specimen 3 of 4

Otázka 1 (4 b.) A point mass is moving along a straight line. The trajectory of its motion s (in meters) depends on time t (in seconds) through the relation $s = \frac{1}{4}t^4 - 4t^3 + 16t^2$. The velocity is zero (in meters per second) at the times (in seconds) equal

a) 0, 3, 6 b) 0, 4, 8 c) 0, 5, 10 d) 0, 3, 8 e) 0, 4, 6

Question 2 (4 p.) Compute $\lim_{x\to+\infty} \operatorname{tg}(\pi - \operatorname{arctg} x)$ if exists.

a) $+\infty$ b) $-\infty$

c) 0 d) 1

e) does not exist

Otázka 3 (4 b.) Function $f(x) = x^5 + 5x - 6$ is convex on the interval

a) $(0, 10)$ b) $(-1, 10)$ c) $(-1, 1)$ d) $(-2, 2)$ e) $(-10, 10)$

Otázka 4 (8 b.) A tangent line to the graph of the function $f(x) = x^2 - 7x + 3$ is parallel to the straight line $5x + y - 3 = 0$, if the x-coordinate of the touch point is equal to

a) 0 b) 1 c) -1 d) $\frac{1}{2}$ e) $-\frac{1}{2}$

$\Big[$Correct answers: b – b – a – b$\Big]$

Test 1 MT01: specimen 4 of 4

Otázka 1 (4 b.) Calculate $\lim\limits_{n\to\infty} \dfrac{2^{3n} + 3^{2n}}{8^{n+1} - 2^n \cdot 5^n}$.

a) 0 b) 1 c) $\frac{1}{8}$ d) $+\infty$ e) $-\infty$

Otázka 2 (4 b.) Function $f(x) = \mathrm{e}^x(x-1) - 5$ is decreasing on the interval

a) $\langle 0, 1\rangle$ b) $\langle 1, 2\rangle$ c) $\langle 2, 5\rangle$ d) $\langle -3, \frac{1}{2}\rangle$ e) $\langle -3, -\frac{1}{2}\rangle$

Otázka 3 (4 b.) The tangent line to the graph of the function $f(x) = -x^2 + 2x$, which is parallel with the x-axis, has the touch point with the x-coordinate equal to

a) 4 b) 2 c) 1 d) 0 e) -1

Question 4 (8 p.) Function $f(x) = x^3 - 3x - 8$ on the interval $(-2, 3)$ has its global maximum

a) at the point -1 b) at the point 0

c) at the point 1 d) at the point 2

e) nowhere

[Correct answers: a – e – c – e]