

Analysis I Test №3, var2, 2016

Date : _____

Student (names): _____, faculty № _____

Solve the following problems :

Problem 1. Find the integrals:

a) $\int \frac{x}{(1+3x^2)^4} dx$ (3p.); b) $\int x \sin(3x) dx$ (3p.).

Problem 2. Using suitable substitution, find the integrals:

$$\int \frac{e^{2x}}{e^{2x} - 5e^x + 4} dx \quad (6p.).$$

Problem 3. Calculate the following definite integral;

$$\int_{-1}^3 x \arctan(x) dx \quad (6p.).$$

Problem 4.

a) Find the area bounded by the curves $x = y^2$, $x + y = 3$ (3p.);

b) Find the length of the arc from the curve γ given by the equations

$$\gamma : x(t) = 5 \cos t, \quad y(t) = 5 \sin t, \quad z = 4t, \quad t \in [0, 2\pi] \quad (3p.)$$

Problem 5. Let $f(x)$ be a continuous and an odd function, defined on the interval $[-a, a]$, $a > 0$.

a) Prove that $\int_{-a}^a f(x) dx = 0$; b) find the integral $\int_{-3}^3 (1001x + 5 + \arctan^7(x)) dx$.

For any successfully solved problem you get 6 points.

The corresponding ratings are as follows: If total number of your points Σ is:

$\Sigma < 10 \Leftrightarrow$ Poor (2), for $10 \leq \Sigma \leq 16 \Leftrightarrow$ Satisfactory (3); for $17 \leq \Sigma \leq 21 \Leftrightarrow$ Good (4),

for $22 \leq \Sigma \leq 26 \Leftrightarrow$ Very good (5) and $27 \leq \Sigma \leq 30 \Leftrightarrow$ Excellent (6).

$\Sigma =$ _____

Rating: _____ Signature: _____

/ Ivan Dimitrov /

Analysis I Test №2

Date : _____

Student (names): _____, **faculty №** _____

Solve the following problems :

Problem 1. Find the derivatives:

a) $y = \sqrt[3]{x} \cos x + \frac{3^x}{2+x^3} - 4 \arcsin x$ (5p.); b) $y = \frac{\sqrt{(3x^2+2x+3)^5}}{e^{2x}}$, $y'(0) = ?$ (5p.).

Problem 2. Find:

a) The equation of the tangent line to the curve at the given point: $y = x^4 - 5x^2$ at $x_0 = 1$ (4p.);

b) The angle between given curves at the points of intersection

$y = \frac{1}{x}$ and $y = x^2$ (6p.).

Problem 3. Using the L'Hospital's rule find the limits:

a) $\lim_{x \rightarrow 0} \frac{\sin 3x - \operatorname{tg} 3x}{x - x \cos 2x} = ?$ (4p.);

b) $\lim_{x \rightarrow \infty} (x + e^x)^{\frac{1}{x}}$ (6p.).

Problem 4.

a) For the function $y = \frac{x^2 + 2x}{x-1}$ find the intervals of monotony, local extrema and asymptotes (6p.);

b) Let $f(x) = \sqrt[3]{x^2} + 4x + 2$. Find the least and the greatest values of f when $x \in [-3, 2]$. (4p.)

For any successfully solved problem you get 10 points.

The corresponding ratings are as follows: If total number of your points Σ is:

$\Sigma < 10 \Leftrightarrow$ **Poor (2)**, for $\Sigma = 10 \Leftrightarrow$ **Satisfactory (3)**; for $\Sigma = 20 \Leftrightarrow$ **Good (4)**, for $\Sigma = 30 \Leftrightarrow$ **Very good (5)** and $\Sigma = 40 \Leftrightarrow$ **Excellent (6)**.

$\Sigma =$ _____

Rating: _____ **Signature:** _____

/ Ivan Dimitrov /

Analysis I Test №3, var2, 2016

Date : _____

Student (names): _____, faculty № _____

Solve the following problems :

Problem 1. Find the integrals:

a) $\int \frac{x}{(1+3x^2)^4} dx$ (3p.); b) $\int x \sin(3x) dx$ (3p.).

Problem 2. Using suitable substitution, find the integrals:

$$\int \frac{e^{2x}}{e^{2x} - 5e^x + 4} dx \quad (6p.).$$

Problem 3. Calculate the following definite integral;

$$\int_{-1}^3 x \arctan(x) dx \quad (6p.).$$

Problem 4.

a) Find the area bounded by the curves $x = y^2$, $x + y = 3$ (3p.);

b) Find the length of the arc from the curve γ given by the equations

$$\gamma : x(t) = 5 \cos t, \quad y(t) = 5 \sin t, \quad z = 4t, \quad t \in [0, 2\pi] \quad (3p.)$$

Problem 5. Let $f(x)$ be a continuous and an odd function, defined on the interval $[-a, a]$, $a > 0$.

a) Prove that $\int_{-a}^a f(x) dx = 0$; b) find the integral $\int_{-3}^3 (1001x + 5 + \arctan^7(x)) dx$.

For any successfully solved problem you get 6 points.

The corresponding ratings are as follows: If total number of your points Σ is:

$\Sigma < 10 \Leftrightarrow$ Poor (2), for $10 \leq \Sigma \leq 16 \Leftrightarrow$ Satisfactory (3); for $17 \leq \Sigma \leq 21 \Leftrightarrow$ Good (4),

for $22 \leq \Sigma \leq 26 \Leftrightarrow$ Very good (5) and $27 \leq \Sigma \leq 30 \Leftrightarrow$ Excellent (6).

$\Sigma =$ _____

Rating: _____ Signature: _____

/ Ivan Dimitrov /

Analysis I Test №3, 2017

Date : _____

Student (names): _____, faculty № _____

Solve the following problems :

Problem 1. Find the integrals:

a) $\int x\sqrt[3]{(3x^2 - 2)}dx$ (3p.); b) $\int x \ln(x + 2)dx$ (3p.).

Problem 2. Using suitable substitution, find the integrals:

a): $\int \frac{1}{\sqrt{1-2x} - \sqrt[3]{1-2x}} dx$ (6p.);

Problem 3. Calculate the following definite integrals :

$\int_{-1}^3 (2x - 3)e^{\frac{1}{3}x} dx$ (3p.).

Problem 4.

a) Find the area bounded by the curve $c_1 : y = x^2 - x, y = 4x, x \geq 0$ (3p.);

b) Find the length of the arc from the curve γ given by the equations

$\gamma : x(t) = \frac{1}{3} \cos^3 2t, y(t) = \frac{1}{3} \sin^3 2t, t \in [0, \pi / 4]$ (3p.)

Problem 5. Prove that

a) if $f(x)$ is an even function, defined on the interval $[-a, a]$ and continuous on this interval, then

$\int_{-a}^a f(x)dx = 2 \int_0^a f(x)dx$; (3p) b) find the integral $\int_{-\pi}^{\pi} x^2 \cos x dx$ (3p)

For any successfully solved problem you get 6 points.

The corresponding ratings are as follows: If total number of your points Σ is:

$\Sigma < 10 \Leftrightarrow$ **Poor (2)**, for $10 \leq \Sigma \leq 16 \Leftrightarrow$ **Satisfactory (3)**; for $17 \leq \Sigma \leq 21 \Leftrightarrow$ **Good (4)**,
for $22 \leq \Sigma \leq 26 \Leftrightarrow$ **Very good (5)** and $27 \leq \Sigma \leq 30 \Leftrightarrow$ **Excellent (6)**.

$\Sigma =$ _____

Rating: _____ **Signature:** _____

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