MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!**

IME I PREZIME: Anamaria Jozić

BROJ INDEKSA: 17-2-0104-2011

POPUNJAVA NASTAVNIK
Broj ↓ bodova

1. Odrediti integracijom (analitički): $\int_{-4}^{-1} x^2 e^x \, dx$. — 15

2. Izračunati $\displaystyle\int_0^2 \frac{2x^2+x+2}{x^2-1}\,dx$ — ~~15~~

3. Zadane su točke $A(2,2,4)$, $B(0,-1,3)$ i $C(-1,0,2)$. Koliki je kut između pravaca AB i AC? Integracijom izračunati površinu trokuta ABC. — 5+10

4. Ispitati domenu i ekstreme funkcije $f(x,y) = x^2 + y^2 + \dfrac{2}{xy}$. — ~~20~~ 15

5. Riješiti: $y' + 2xy = x - 3$. — 20

6. Riješiti: $y'' - 4y' + 4y = 4$. — 15

Ukupno: 45

Tablični integrali

$\int dx = x + C$	$\int \frac{dx}{a^2+x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$	$\int \frac{dx}{a^2-x^2} = \frac{1}{2a}\ln\left\lvert\frac{a+x}{a-x}\right\rvert + C$
$\int x^\alpha \, dx = \frac{x^{\alpha+1}}{\alpha+1},\ \alpha \neq -1$	$\int \tan x \, dx = -\ln\lvert\cos x\rvert$	$\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\ln\left\lvert\frac{x-a}{x+a}\right\rvert + C$
$\int \frac{dx}{x} = \ln\lvert x\rvert + C$	$\int \cot x \, dx = \ln\lvert\sin x\rvert + C$	$\int \frac{dx}{\sqrt{x^2 \pm a^2}} = \ln\left\lvert x + \sqrt{x^2 \pm a^2}\right\rvert + C$
$\int e^x \, dx = e^x + C$	$\int \frac{dx}{\cos^2 x} = \tan x + C$	$\int \frac{dx}{\sqrt{a^2 - x^2}} = \arcsin\frac{x}{a} + C$
$\int a^x \, dx = \frac{a^x}{\ln a} + C$	$\int \frac{dx}{\sin^2 x} = -\cot x + C$	$\int \frac{dx}{\sqrt{2ax - x^2}} = \arccos\left(1 - \frac{x}{a}\right) + C$
$\int \sin x \, dx = -\cos x + C$	$\int \sinh x \, dx = \cosh x + C$	$\int \sqrt{x^2 \pm a^2}\, dx = \frac{1}{2}\left[x\sqrt{x^2 \pm a^2} \pm a^2 \ln\left(x + \sqrt{x^2 \pm a^2}\right)\right]$
$\int \cos x \, dx = \sin x + C$	$\int \cosh x \, dx = \sinh x + C$	$\int \sqrt{a^2 - x^2}\, dx = \frac{1}{2}\left[x\sqrt{a^2 - x^2} + a^2 \arcsin\left(\frac{x}{a}\right)\right] + C$

1.

$$\int_{-4}^{-1} x^2 e^x \, dx = \left\{ \begin{array}{ll} u = x^2 & dv = \int e^x dx \\ du = 2x\,dx & v = e^x \end{array} \right\}$$

$$= x^2 e^x \Big|_{-4}^{-1} - 2\int_{-4}^{-1} x e^x \, dx \quad \left\{ \begin{array}{ll} u = x & dv = \int e^x \, dx \\ du = dx & v = e^x \end{array} \right\}$$

$$= \left[(-1)^2 e^{-1} - (-4)^2 e^{-4}\right] - 2\cdot\left[x e^x \Big|_{-4}^{-1} - \int_{-4}^{-1} e^x \, dx\right]$$

$$= e^{-1} - 16e^{-4} - 2\left[(-1)\cdot e^{-1} - (-4)\cdot e^{-4} - e^x \Big|_{-4}^{-1}\right]$$

$$= e^{-1} - 16e^{-4} + 2e^{-1} - 8e^{-4} + 2e^{-1} - 2e^{-4}$$

$$= 5e^{-1} - 26e^{-4} = 1.363$$

② $\int_0^2 \frac{2x^2+x+2}{x^2-1}\,dx =$

$x^2-1=0 \Rightarrow x \pm 1$
podintegralna funkcija nije definirana
u $x=1$
NEPRAVILNI INTEGRAL

$= \lim_{\varepsilon_1 \to 1} \int_0^{\varepsilon_1} \frac{2x^2+x+2}{x^2-1}\,dx + \lim_{\varepsilon_2 \to 1} \int_{\varepsilon_2}^2 \frac{2x^2+x+2}{x^2-1}$; $(2x^2+x+2):(x^2-1)=2$
$\cancel{2x^2} \; -+2$
$x+4$

$= \lim_{\varepsilon_1 \to 1} \int_0^{\varepsilon_1} \left(2+\frac{x+4}{x^2-1}\right)dx + \lim_{\varepsilon_2 \to 1} \int_{\varepsilon_2}^2 \left(2+\frac{x+4}{x^2-1}\right)dx$

$= \lim_{\varepsilon_1 \to 1} \left[2x\Big|_0^{\varepsilon_1} + \int_0^{\varepsilon_1} \frac{x}{x^2-1}\,dx + 4\int_0^{\varepsilon_1} \frac{dx}{x^2-1}\right] + \lim_{\varepsilon_2 \to 1}\left[2x\Big|_{\varepsilon_2}^2 + \int_{\varepsilon_2}^2 \frac{x}{x^2-1}\,dx + 4\int_{\varepsilon_2}^2 \frac{dx}{x^2-1}\right]$

$= \left\{ \begin{array}{l} x^2-1=t \\ 2x\,dx = dt \\ x\,dx = \frac{1}{2}dt \end{array} \right\}$

$= \lim_{\varepsilon_1 \to 1} \left[2\varepsilon_1 + \frac{1}{2}\ln(x^2-1)\Big|_0^{\varepsilon_1} + \frac{4}{2}\ln\left|\frac{x-1}{x+1}\right|\Big|_0^{\varepsilon_1}\right] \lim_{\varepsilon_2 \to 1}\left[2(2-\varepsilon_2)+\frac{1}{2}\right.$
$\left.\ln|x^2-1|\Big|_{\varepsilon_2}^2 + \frac{4}{2}\ln\left|\frac{x-1}{x+1}\right|\Big|_{\varepsilon_2}^2\right]$

$= 2 + \frac{1}{2}\lim_{\varepsilon_1 \to 1}\left[\ln|\varepsilon_1^2-1| - \ln|-1|\right] + 2\lim_{\varepsilon_1 \to 1}\left[\ln\left|\frac{\varepsilon_1-1}{\varepsilon_1+1}\right| - \ln\left|\frac{-1}{1}\right|\right.$

$+2+\frac{1}{2}\lim_{\varepsilon_2 \to 1}\left[\ln|5| - \ln|\varepsilon_2^2-1|\right] + 2\lim_{\varepsilon_1 \to 1}\left[\ln\left|\frac{1}{3}\right| - \ln\left|\frac{\varepsilon_2-1}{\varepsilon_2+1}\right|\right]$

$= 4 + \frac{1}{3}\underbrace{\lim_{\varepsilon_1 \to 1} \ln|\varepsilon_1^2-1|}_{\to -\infty} - \cancel{\ln 1} + 2\lim_{\varepsilon_1 \to 1}\left|\frac{\varepsilon_1-1}{\varepsilon_1+1}\right| - \cancel{\ln_1} + \frac{1}{2}\ln 5 - \frac{1}{2}\lim_{\varepsilon_2 \to 1}|\varepsilon_2^2-1|$

$2\lim_{\varepsilon_1 \to 1}\left|\frac{\varepsilon_1-1}{\varepsilon_1+1}\right| \quad = 4+0.8-2.14 = 2.6$

③

OVAJ INTEGRAL DIVERGIRA
ZBOG

$\lim_{\varepsilon_1 \to 1} \ln|\varepsilon_1^2-1| = \lim_{t \to 1} \ln|t-1|$

$= \lim_{u \to 0} \ln|u| = \lim_{u \to 0_+} \ln u$

$= -\infty$

Anamaria Jozić

6.) $y'' - 4y' + 4y = 4$

$x^2 - 4r + 4 = 0$

$r_{1/2} = \frac{4 \pm \sqrt{16-16}}{2} = 2$

$y_H = C_1 e^{2x} + C_2 x e^{2x} \qquad C_1, C_2 \in \mathbb{R}$

PARTIKULARNI

$y_p = A$

$y_p' = 0$

$y_p'' = 0$

$4A = 4$

$A = 1$

$y_p = 1$

$y = y_H + y_p = C_1 e^{2x} + C_2 x e^{2x} + 1$ ✓

PROVJERA

$y' = 2C_1 e^{2x} + C_2 e^{2x} + 2C_2 x e^{2x}$

$\cancel{y'' = 6C_1 e^{2x} + 2C e^{2x}}$

$= (2C_1 + C_2) e^{2x} + 2C_2 x e^{2x}$

$y'' = (4C_1 + 2C_2) e^{2x} + 2C_2 e^{2x} + 4C_2 x e^{2x}$

$= (4C_1 + 4C_2) e^{2x} + 4C_2 x e^{2x}$

$y'' - 4y' + 4y = e^{2x}(\underbrace{4C_1 + 4C_2 - 8C_1 - 4C_2 + 4C_1}_{=0}) + xe^{2x}(\underbrace{4C_2 - 8C_2 + 4C_2}_{=0}) + 4 = 4$ ✓

4) $f(x,y) = x^2 + y^2 + \frac{2}{xy}$

DOMENA?

$\frac{\partial f}{\partial x}(x,y) = 2x - \frac{2}{yx^2}$

$\frac{\partial f}{\partial y}(x,y) = 2y - \frac{2}{xy^2}$

$2x - \frac{2}{yx^2} = 0 \Rightarrow 2x = \frac{2}{yx^2} \quad / \frac{y}{x} \quad /:2$

$y = \frac{1}{x^3}$

$2y - \frac{2}{xy^2} = 0$

$\frac{2}{x^3} = \frac{2}{x \cdot \frac{1}{x^6}}$

$\Rightarrow x^3 = x^5$

$x^5 - x^3 = 0$

$x^3(x^2 - 1) = 0$

$x_1 = 0$ ✓ $\quad x_2 = 1$ ✓ $\quad x_3 = -1$ ✓

$y_1 = \infty$ ✓ $\quad y_2 = 1$ ✓ $\quad y_3 = -1$ ✓

$T_1(1,1)$

$T_2(-1,-1)$

T_1: 6 6 2 $\quad$ 6 6 2

$\frac{\partial^2 f}{\partial x^2}(x,y) = 2 + \frac{4}{yx^3}$

$\frac{\partial^2 f}{\partial y^2}(x,y) = 2 + \frac{4}{xy^3}$

$\frac{\partial^2 f}{\partial x \partial y}(x,y) = \frac{2}{y^2 x^2}$

$\Delta \begin{vmatrix} 6 & 2 \\ 2 & 6 \end{vmatrix} = 36 - 4 = 32 > 0$

u T_1 T_2 MINIMUM ✓

15

MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!**	POPUNJAVA NASTAVNIK
IME I PREZIME: VALENTINO ŠARE **BROJ INDEKSA:** 17-2-0149-2011	Broj ↓ bodova

1. Odrediti integracijom (analitički): $\int_{-4}^{-1} x^2 e^x \mathrm{d}x$. — 15

2. Izračunati $\displaystyle\int_0^2 \frac{2x^2+x+2}{x^2-1}\,\mathrm{d}x$ — 15

3. Zadane su točke $A(2,2,4)$, $B(0,-1,3)$ i $C(-1,0,2)$. Koliki je kut između pravaca AB i AC? Integracijom izračunati površinu trokuta ABC. — 5+10

4. Ispitati domenu i ekstreme funkcije $f(x,y) = x^2 + y^2 + \dfrac{2}{xy}$. — 20

5. Riješiti: $y' + 2xy = x - 3$. — 20

6. Riješiti: $y'' - 4y' + 4y = 4$. — 15

Ukupno: 0

Tablični integrali

$\int \mathrm{d}x = x + C$	$\int \frac{\mathrm{d}x}{a^2+x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$	$\int \frac{\mathrm{d}x}{a^2-x^2} = \frac{1}{2a}\ln\left\|\frac{a+x}{a-x}\right\| + C$
$\int x^\alpha \mathrm{d}x = \frac{x^{\alpha+1}}{\alpha+1},\ \alpha \neq -1$	$\int \tan x\,\mathrm{d}x = -\ln\|\cos x\|$	$\int \frac{\mathrm{d}x}{x^2-a^2} = \frac{1}{2a}\ln\left\|\frac{x-a}{x+a}\right\| + C$
$\int \frac{\mathrm{d}x}{x} = \ln\|x\| + C$	$\int \cot x\,\mathrm{d}x = \ln\|\sin x\| + C$	$\int \frac{\mathrm{d}x}{\sqrt{x^2\pm a^2}} = \ln\left\|x + \sqrt{x^2\pm a^2}\right\| + C$
$\int e^x \mathrm{d}x = e^x + C$	$\int \frac{\mathrm{d}x}{\cos^2 x} = \tan x + C$	$\int \frac{\mathrm{d}x}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C$
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1) $\displaystyle\int_{-4}^{-1} x^2 \cdot e^x dx = \begin{bmatrix} u = x^2 & dv = e^x \\ du = 2x\,dx & v = e^x \end{bmatrix}$

$= u \cdot v - \int v\,du$

$= x^2 e^x - \int e^x 2x\,dx$

$= x^2 e^x - 2e^x \Big|_{-4}^{-1} = \left((-1)^2 e^{-1} - 2e^{-1}\right) - \left((-4)^2 e^{-4} - 2e^{-4}\right) = -0.624298 \cdot 1 = 0.624298$

X

$$\int_0^2 \frac{2x^2+x+2}{x^2-1}\,dx =$$

VALENTINO ŠARE

5) $y' + 2xy = x - 3$

6) $y'' - 4y' + 4y = 4$

MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!**

IME I PREZIME: ANTONIO PRIBIL **BROJ INDEKSA:** 57666

POPUNJAVA NASTAVNIK
Broj ↓ bodova

1. Odrediti integracijom (analitički): $\int_{-4}^{-1} x^2 e^x \mathrm{d}x$. 15

2. Izračunati $\displaystyle\int_0^2 \frac{2x^2+x+2}{x^2-1}\,\mathrm{d}x$ 15

3. Zadane su točke $A(2,2,4)$, $B(0,-1,3)$ i $C(-1,0,2)$. Koliki je kut između pravaca AB i AC? Integracijom izračunati površinu trokuta ABC. 5+10

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5. Riješiti: $y'+2xy=x-3$. 20

6. Riješiti: $y''-4y'+4y=4$. 15

Ukupno: $\emptyset$

Tablični integrali

$\int \mathrm{d}x = x + C$	$\int \frac{\mathrm{d}x}{a^2+x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$	$\int \frac{\mathrm{d}x}{a^2-x^2} = \frac{1}{2a}\ln\left\lvert\frac{a+x}{a-x}\right\rvert + C$
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$\int \frac{\mathrm{d}x}{x} = \ln\lvert x\rvert + C$	$\int \cot x\,\mathrm{d}x = \ln\lvert\sin x\rvert + C$	$\int \frac{\mathrm{d}x}{\sqrt{x^2\pm a^2}} = \ln\left\lvert x+\sqrt{x^2\pm a^2}\right\rvert + C$
$\int e^x \mathrm{d}x = e^x + C$	$\int \frac{\mathrm{d}x}{\cos^2 x} = \tan x + C$	$\int \frac{\mathrm{d}x}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C$
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ANTONIO PRIBIL 57666 MATEMATIKA 2

$$2 \cdot \int \frac{x^2 + x + 2}{x^2 - 1}\,dx = 2\int \frac{\frac{x^{2+1}}{2+1} + x}{\frac{x^{2+1}}{2+1} - 1} = 2\int \frac{\frac{x^3}{3} + x}{\frac{x^3}{3} - 1} = 2\int_0^2 \frac{3x^3 + x}{3x^3 - 1} =$$

$$= 2\int \frac{3 \cdot 2^3 + 2}{3 \cdot 0^3 - 1} = 2\int \frac{3 \cdot 8 + 2}{-1} = 2 \cdot \int \frac{26}{-1}$$

MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!**	POPUNJAVA NASTAVNIK
IME I PREZIME: ROKO DUŠEVIĆ **BROJ INDEKSA:** 57351-2009	Broj ↓ bodova

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6. Riješiti: $y'' - 4y' + 4y = 4$. — 15

Ukupno: 0

Tablični integrali

$\int \mathrm{d}x = x + C$	$\int \frac{\mathrm{d}x}{a^2+x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$	$\int \frac{\mathrm{d}x}{a^2-x^2} = \frac{1}{2a}\ln\left\lvert\frac{a+x}{a-x}\right\rvert + C$
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1. $$\int_{-4}^{-1} x^2 e^x\,dx = \left[\begin{array}{ll} u = x^2 & dv = e^x\,dx \\ du = 2x & v = e^x \end{array}\right] = uv - \int_{-4}^{-1} v\,du = x^2e^x - \int_{-4}^{-1} e^x 2x\,dx =$$ PAŽE

0

2. $$\int_0^2 \frac{2x^2+x+2}{x^2-1}\,dx =$$

3) $A(2,2,4), B(0,-1,3), C(-1,0,2)$

MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!**

IME I PREZIME: Lovre Kresović

BROJ INDEKSA: 56640-2008

POPUNJAVA NASTAVNIK

Broj ↓ bodova

1. Odrediti integracijom (analitički): $\int_{-4}^{-1} x^2 e^x \mathrm{d}x$. 15

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$\int a^x \mathrm{d}x = \frac{a^x}{\ln a} + C$	$\int \frac{\mathrm{d}x}{\sin^2 x} = -\cot x + C$	$\int \frac{\mathrm{d}x}{\sqrt{2ax-x^2}} = \arccos\left(1-\frac{x}{a}\right) + C$
$\int \sin x\,\mathrm{d}x = -\cos x + C$	$\int \sinh x\,\mathrm{d}x = \cosh x + C$	$\int \sqrt{x^2\pm a^2}\,\mathrm{d}x = \frac{1}{2}\left[x\sqrt{x^2\pm a^2} \pm a^2\ln\left(x+\sqrt{x^2\pm a^2}\right)\right]$
$\int \cos x\,\mathrm{d}x = \sin x + C$	$\int \cosh x\,\mathrm{d}x = \sinh x + C$	$\int \sqrt{a^2-x^2}\,\mathrm{d}x = \frac{1}{2}\left[x\sqrt{a^2-x^2} + a^2\arcsin\left(\frac{x}{a}\right)\right] + C$

MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!**

IME I PREZIME: ANDRO KLARIN **BROJ INDEKSA:**

POPUNJAVA NASTAVNIK
Broj ↓ bodova

1. Odrediti integracijom (analitički): $\int_{-4}^{-1} x^2 e^x dx$. 15
2. Izračunati $\displaystyle\int_0^2 \frac{2x^2+x+2}{x^2-1}\,dx$ 15
3. Zadane su točke $A(2,2,4)$, $B(0,-1,3)$ i $C(-1,0,2)$. Koliki je kut između pravaca AB i AC? Integracijom izračunati površinu trokuta ABC. 5+10
4. Ispitati domenu i ekstreme funkcije $f(x,y) = x^2 + y^2 + \dfrac{2}{xy}$. 20
5. Riješiti: $y' + 2xy = x - 3$. 20
6. Riješiti: $y'' - 4y' + 4y = 4$. 15

Ukupno:

Tablični integrali

$\int dx = x + C$	$\int \frac{dx}{a^2+x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$	$\int \frac{dx}{a^2-x^2} = \frac{1}{2a}\ln\left\lvert\frac{a+x}{a-x}\right\rvert + C$
$\int x^\alpha dx = \frac{x^{\alpha+1}}{\alpha+1},\ \alpha \neq -1$	$\int \tan x\, dx = -\ln\lvert\cos x\rvert$	$\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\ln\left\lvert\frac{x-a}{x+a}\right\rvert + C$
$\int \frac{dx}{x} = \ln\lvert x\rvert + C$	$\int \cot x\, dx = \ln\lvert\sin x\rvert + C$	$\int \frac{dx}{\sqrt{x^2 \pm a^2}} = \ln\left\lvert x + \sqrt{x^2 \pm a^2}\right\rvert + C$
$\int e^x dx = e^x + C$	$\int \frac{dx}{\cos^2 x} = \tan x + C$	$\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C$
$\int a^x dx = \frac{a^x}{\ln a} + C$	$\int \frac{dx}{\sin^2 x} = -\cot x + C$	$\int \frac{dx}{\sqrt{2ax-x^2}} = \arccos\left(1 - \frac{x}{a}\right) + C$
$\int \sin x\, dx = -\cos x + C$	$\int \sinh x\, dx = \cosh x + C$	$\int \sqrt{x^2 \pm a^2}\, dx = \frac{1}{2}\left[x\sqrt{x^2 \pm a^2} \pm a^2 \ln\left(x + \sqrt{x^2 \pm a^2}\right)\right]$
$\int \cos x\, dx = \sin x + C$	$\int \cosh x\, dx = \sinh x + C$	$\int \sqrt{a^2-x^2}\, dx = \frac{1}{2}\left[x\sqrt{a^2-x^2} + a^2 \arcsin\left(\frac{x}{a}\right)\right] + C$