MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** 000	POPUNJAVA NASTAVNIK Broj ↓ bodova
IME I PREZIME: MAJE ĆOSIĆ **BROJ INDEKSA:** 55924	

/ 1. Odredi partikularno rješenje koje zadovoljava navedenu ODJ i uvjete: $y'' - 2y' = 1$, uz $y(0) = 1$ i $y'(0) = 0$. Na kraju provjeri rješenje. 15

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/ 4. $\int_0^{\pi} \cos(x)\sin^2(x)\,\mathrm{d}x = ?$ 15

/ 5. $\int_0^2 \frac{x^2-1}{x^2+1}\mathrm{d}x = ?$ 20

/ 6. Izračunati površinu lika omeđenog pravcem $y = x + 1$ i parabolom $y = x^2 + 3x - 2$. 20

Ukupno: 50

f	$\frac{df}{dx}$
$x^\alpha\ (\alpha \neq 0)$	$\alpha x^{\alpha-1}$
$\ln x$	$\frac{1}{x}$
$\log_\alpha x\ (\alpha > 0)$	$\frac{1}{x\ln\alpha}$
e^x	e^x
$\alpha^x\ (\alpha > 0)$	$\alpha^x \ln\alpha$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\frac{1}{\cos^2 x}$
$\cot x$	$\frac{-1}{\sin^2 x}$
$\arcsin x$	$\frac{1}{\sqrt{1-x^2}}$
$\arctan x$	$\frac{1}{1+x^2}$

Tablica nekih integrala

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

$f(x)\ \frac{x^2-1}{x^2+1}$ $\quad x^2+1 \neq 0$

$x^2 = -1$

$x = \pm 1$ × $\quad$ 0 1 2

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

$\lim_{x\to1^-}\int_0^{1}\frac{x^2-1}{x^2+1}dx + \lim_{x\to1^+}\int_{1}^{2}\frac{x^2-1}{x^2+1}$

$\int\frac{x^2-1}{x^2+1}dx \qquad (x^2-1):(x^2+1) = 1$

$-x^2-1$

-2

$\lim_{x\to1^-} x - \arctan x\Big|_0^1 + \lim_{x\to1^+} x - 2\arctan x\Big|_1^2$

$\int dx - 2\int\frac{dx}{x^2+1} = x - 2\arctan x$ ✓

$\lim_{x\to1^-} 1-\arctan 1 - (0-\arctan 0) + \lim_{x\to1^+} 2-\arctan 2 - (1-\arctan 1)$

$0{,}21 + 0{,}68 = 0{,}88$ × $\quad \emptyset$

PROVJERA NUMERIČKOM INTEGRACIJOM BI VAS SPASILA. —

4.) $\int_0^{\pi} \cos(x)\sin^2(x)\,dx =$

$$= \frac{\sin^3 x}{3}\Big|_0^{\pi} = \frac{\sin^3\pi}{3} - \frac{\sin^3 0}{0}$$

$$= 0 - 0 = 0$$

$$\int \cos x \sin^2 x\,dx = \begin{bmatrix} \sin x = t \\ \cos x\,dx = dt \end{bmatrix}$$

$$\int t^2\,dt = \frac{t^3}{3} = \frac{\sin^3 x}{3}$$

6) $y = x + 1$ $\qquad y = x^2 + 3x - 2$

x	0	1	2
$y=x+1$	1	2	3

$$x^2 + 3x - 2 = x + 1$$
$$x^2 + 3x - x - 2 - 1$$
$$x^2 + 2x - 3 = 0$$
$$x_{1,2} = \frac{-2 \pm \sqrt{4 - 4\cdot 1(-3)}}{2}$$
$$x_{1,2} = \frac{-2 \pm 4}{2}$$

$x_1 = -3 \qquad x_2 = 1$

$y_1 = -2 \qquad y_2 = 2$

$S_1(-3,-2) \qquad S_2(1,2)$

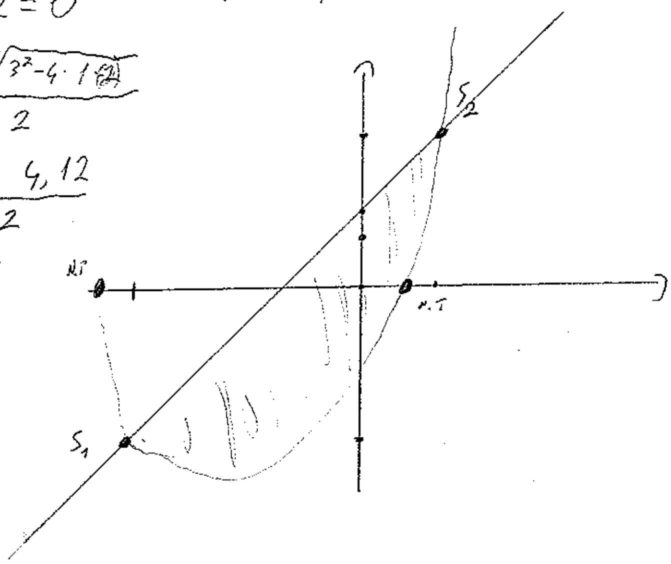
$x^2 > 0$

$\cup$

$$x^2 + 3 - 2 = 0$$
$$x_{1,2} = \frac{-3 \pm \sqrt{3^2 - 4\cdot 1(-2)}}{2}$$
$$x_{1,2} = \frac{-3 \pm 4,12}{2}$$

$x_1 = -3,56$

$x_2 = 0,56$



$$P = \int_{-3}^{1} x + 1 - (x^2 + 3x - 2)\,dx$$

$$P = \int_{-3}^{1} x + 1 - x^2 - 3x + 2\,dx = \int_{-3}^{1} -x^2 - 2x + 3\,dx = -\frac{x^3}{3} - 2\frac{x^2}{2} + 3x\Big|_{-3}^{1}$$

$$P = -\frac{1^3}{3} - 2\frac{1^2}{2} + 3\cdot 1 - \left(-\frac{(-3)^3}{3} - 2\frac{(-3)^2}{2} + 3\cdot(-3)\right) = -\frac{1}{3} - 1 + 3 + 9 = \frac{32}{3}$$

MATE ĆOSIĆ

BR. IND. 55924

1) $y'' - 2y' = 1 \qquad y(0) = 1, \quad y'(0) = 0$

$y'' = r^2 \quad y' = r$

$r^2 - 2r = 0$

$r(r-2) = 0$

$r_1 = 0 \quad r_2 = 2$

$y_H = C_1 e^{r_1 x} + C_2 e^{r_2 x}$

$y_H = C_1 e^{0} + C_2 e^{2x}$

$y_H = C_1 + C_2 e^{2x}$

$1 = e^{\alpha x}\left(P_m(x)\cos(\beta x) + Q_n(x)\sin(\beta x)\right)$

$\alpha = 0 \quad \beta = 0 \quad \alpha + \beta i = 0 + 0i = r_1 \neq r_2 \Rightarrow \boxed{k = 1}$

$1 = P_m(x) \quad m = 0 \qquad Q_n = 0 \quad n = NIP$

$N = \max\{m, n\}$

$y_P = x^k e^{\alpha x}\left(S_N(x)\cos(\beta x) + T_N(x)\sin(\beta x)\right) \quad N = 0$

$y_P = x\, S_N(x)$

$y_P = Ax$

$y_P' = A \qquad y'' - 2y' = 1$

$y_P'' = 0 \qquad 0 - 2A = 1$

$-2A = 1$

$A = -\frac{1}{2}$

$y_P = -\frac{1}{2}x$

$y = y_H + y_P$

$y = C_1 + C_2 e^{2x} - \frac{1}{2}x$

$y' = 2C_2 e^{2x} - \frac{1}{2}$

$1 = C_1 + C_2 e^{0} - \frac{1}{2}\cdot 0$

$0 = 2C_2 e^{0} - \frac{1}{2}$

$1 = C_1 + C_2$

$0 = 2C_2 - \frac{1}{2}$

$C_1 + C_2 = 1$

$2C_2 - \frac{1}{2} = 0 \Rightarrow 2C_2 = \frac{1}{2} \quad /2$

$C_2 = \frac{1}{4}$

$C_1 + \frac{1}{4} = 1$

$C_1 = \frac{3}{4}$

PROVJERA

$y = \frac{3}{4} + \frac{1}{4}e^{2x} - \frac{1}{2}x$

$y' = \frac{1}{2}e^{2x} - \frac{1}{2}$

$y'' = e^{2x}$

$e^{2x} - 2\left(\frac{1}{2}e^{2x} - \frac{1}{2}\right) = 1$

$\cancel{e^{2x}} - \cancel{e^{2x}} + 1 = 1$

$1 = 1$

$$\boxed{y = \frac{3}{4} + \frac{1}{4}e^{2x} - \frac{1}{2}x}$$

PROVJERA

$y(0) = \frac{3}{4} + \frac{1}{4} = 1$ ✓

$y'(0) = \frac{1}{2} - \frac{1}{2} = 0$ ✓

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IME I PREZIME: NIKOLA TOMASOV **BROJ INDEKSA:** 17-2-0161-2012	Broj ↓ bodova

1. Odredi partikularno rješenje koje zadovoljava navedenu ODJ i uvjete: $y'' - 2y' = 1$, uz $y(0) = 1$ i $y'(0) = 0$. Na kraju provjeri rješenje. 15

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5. $\int_0^2 \frac{x^2-1}{x^2+1} dx = ?$ 20

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Ukupno: 30

f	$\frac{df}{dx}$
$x^\alpha\ (\alpha \neq 0)$	$\alpha x^{\alpha-1}$
$\ln x$	$\frac{1}{x}$
$\log_\alpha x\ (\alpha > 0)$	$\frac{1}{x \ln \alpha}$
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1. $y'' - 2y' = 1 \qquad y(0) = 1 \quad i \quad y'(0) = 0$

$r^2 - 2r = 0$

$r(r-2) = 0$

$\boxed{r_1 = 0}$

$r - 2 = 0$

$\boxed{r_2 = 2}$

$y_H = C_1 e^{r_1 x} + C_2 e^{r_2 x}$

$y_H = C_1 + C_2 e^{2x}$

$y_p = K_1 x$

$y_p' = K_1$

$y_p'' = 0$

$y = C_1 + C_2 e^{2x} - \frac{1}{2}x$

$y' = 2C_2 e^{2x} - \frac{1}{2}$

$y'(0) = 0$

$2C_2 - \frac{1}{2} = 0$

$C_2 = \frac{1}{4}$

$-2K_1 = 1$

$K_1 = -\frac{1}{2}$

$\boxed{y_p = -\frac{1}{2}x}$

$y(0) = 1$

$C_1 + C_2 e^0 = 1$

$C_1 + C_2 = 1$

$C_1 + \frac{1}{4} = 1$

$C_1 = \frac{3}{4}$

$y = y_H + y_p$

$y = \frac{3}{4} + \frac{1}{4}e^{2x} - \frac{1}{2}x$ ✓

PROVJERA:

$y(0) = 1$

$y = \frac{3}{4} + \frac{1}{4} e^0 - \frac{1}{2} \cdot 0 = 1$

$\underline{\underline{1 = 1}}$

$y'(0) = 0$

$y' = 2 \cdot \frac{1}{4} \cdot e^0 - \frac{1}{2} = 0$

$\underline{\underline{0 = 0}}$

4.) $\int_0^{\pi} \cos(x) \sin^2(x)\, dx = \left[\begin{array}{l} t = \sin(x) \\ dt = \cos(x)\, dx \end{array}\right]$

$= \int_0^{\pi} dt \cdot t^2 = \int_0^{\pi} t^2 \cdot dt = \frac{t^3}{3} \Big|_0^{\pi} = \left(\frac{\sin^3(\pi)}{3} - \frac{\sin^3(0)}{3} \right) = \underline{\underline{0}}$ ✓

MATEMATIKA 2: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** 000 **IME I PREZIME:** MARTINO-BOŽIDAR BUKVIĆ **BROJ INDEKSA:** 0171262202	POPUNJAVA NASTAVNIK Broj ↓ bodova

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Ukupno: ∅

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POPUNJAVA NASTAVNIK
Broj ↓
bodova

IME I PREZIME: IVAN GAŠIKA

BROJ INDEKSA: 0269 06 08 44

1. Odredi partikularno rješenje koje zadovoljava navedenu ODJ i uvjete: $y''-2y'=1$, uz $y(0)=1$ i $y'(0)=0$. Na kraju provjeri rješenje. 15

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Ukupno: Ø

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$\int x^\alpha\,\mathrm{d}x=\frac{x^{\alpha+1}}{\alpha+1},\ \alpha\neq-1$	$\int\tan x\,\mathrm{d}x=-\ln\|\cos x\|+C$	$\int\frac{\mathrm{d}x}{x^2-a^2}=\frac{1}{2a}\ln\left\|\frac{x-a}{x+a}\right\|+C$
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IVAN GREINA

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