MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇓⇓ C1

IME I PREZIME: MISLAV ROGOZNICA **BROJ INDEKSA:** 17-2-0345-2013

POPUNJAVA NASTAVNIK
Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 + \overline{i-1} = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 15+3

2. Gaussovom metodom riješi sustav linearnih jednadžbi, a zatim provjeri uvrštavanjem:

$$\begin{aligned} x + 2y - z + u &= 1 \\ 2x + 5y - z + 2u &= -2 \\ 3x - y - 2z + u &= 5 \\ x - y + 3z - 5u &= 6 \end{aligned}$$

Provjeri uvrštavanjem! 16+3

3. Ispitati domenu i sve asimptote funkcije $g(x) = \sqrt{x^2 - x} + x$. 5+15

4. Ispitati tok i nacrtati graf funkcije: $h(x) = \frac{x^2+4}{x^2-2}$. 20(graf) 7

5. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\cos(4x-2))$. 15

6. Izračunati rang matrice: $\begin{bmatrix} -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix}$. 8

Ukupno: 42

5.

$f(x) = \ln(\cos(4x-2))$

$f'(x) = \frac{1}{\cos(4x-2)} \cdot (-\sin(4x-2)) \cdot 4 = \frac{-4\sin(4x-2)}{\cos(4x-2)} = -4\operatorname{tg}$

$= \frac{-4\sin(4x-2)}{\cos(4x-2)} = -4\operatorname{tg}(4x-2)$

3. $g(x) = \sqrt{x^2 - x} + x$

DOMENA:

U: $\sqrt{\ } \geq 0$

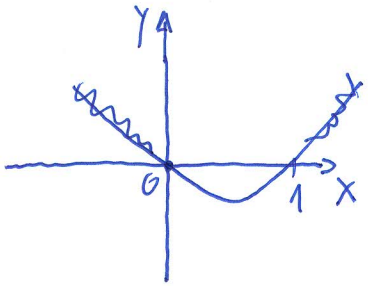
$x^2 - x \geq 0 \Rightarrow a > 0 \cup$

$x^2 - x = 0$

$x(x-1) = 0$

$x_1 = 0, \quad x - 1 = 0$

$x_2 = 1$



$D(f) = \langle -\infty, 0] \cup [1, +\infty \rangle$ ✓

ASIMPTOTE:

~~V.A.~~

~~$\lim_{x \to \pm\infty} \left(\sqrt{x^2 - x} + x \right) = \sqrt{\ }$~~

V.A.

$\lim_{x \to 0} \left(\sqrt{x^2 - x} + x \right) = \sqrt{0^2 - 0} + 0 = 0$

$\lim_{x \to 1} \left(\sqrt{x^2 - x} + x \right) = \sqrt{1^2 - 1} + 1 = 0 + 1 = 1$

$\lim_{x \to 1^+} \left(\sqrt{x^2 - x} + x \right) = \sqrt{1 - 1} + 1 = 0 + 1 = 1$

$\lim_{x \to 1^-} \left(\sqrt{x^2 - x} + x \right) = \sqrt{1 - 1} + 1 = 1$

NEMA V.A.

H.A.

$\lim_{x \to \pm\infty} \left(\sqrt{x^2 - x} + x \right) \cdot \frac{\sqrt{x^2 - x} - x}{\sqrt{x^2 - x} - x} = \lim_{x \to \pm\infty} \frac{x^2 - x - x^2}{\sqrt{x^2 - x} - x} = \frac{-x \ /:x}{\sqrt{x^2 - x} - x \ /:x} =$

$\lim_{x \to \pm\infty} \frac{-\frac{x}{x}^{-1}}{\sqrt{\frac{x^2}{x^2}}_{1} - \frac{x}{x^2}_{0} - \frac{x}{x}_{-1}} = \frac{-1}{1 - 1} = \frac{-1}{0} = \nexists$

NEMA D.H.A.

MISLAV ROGOZNICA

3) L.H.A

$$\lim_{x\to-\infty}\left(\sqrt{x^2-x}+x\right)=\left[\begin{matrix}x\to(-x)\\ -\infty\to+\infty\end{matrix}\right]=\lim_{x\to\infty}\left(\sqrt{(-x)^2+x}-x\right)=$$

$$=\lim_{x\to+\infty}\left(\frac{\sqrt{x^2+x}-x}{1}\right)\cdot\frac{\sqrt{x^2+x}+x}{\sqrt{x^2+x}+x}=\lim_{x\to+\infty}\frac{x^2+x-x^2}{\sqrt{x^2+x}+x}=\lim_{x\to\infty}\frac{x\ /:x}{\sqrt{x^2+x}+x\ /:x}=$$

$$=\lim_{x\to\infty}\frac{\frac{x}{x}}{\sqrt{\frac{x^2}{x^2}+\frac{x}{x^2}}+\frac{x}{x}}=\frac{1}{1+1}=\frac{1}{2}$$

$$\boxed{y=\frac{1}{2}\ \text{je}\ \text{L.H.A.}}\ \checkmark$$

D.K.A.

$$k=\lim_{x\to\infty}\frac{g(x)}{x}=\lim_{x\to\infty}\frac{\sqrt{x^2-x}+x\ /:x}{x\ /:x}=\lim_{x\to\infty}\frac{\sqrt{\frac{x^2}{x^2}-\frac{x}{x^2}}+\frac{x}{x}}{\frac{x}{x}}=\frac{1+1}{1}=\frac{2}{1}=2$$

$$\boxed{k=2}$$

$$b=\lim_{x\to\infty}(g(x)-kx)=\lim_{x\to\infty}\left(\sqrt{x^2-x}+x-2x\right)=\lim_{x\to\infty}\left(\frac{\sqrt{x^2-x}-x}{1}\right)\cdot\frac{\left(\sqrt{x^2-x}+x\right)}{\left(\sqrt{x^2-x}+x\right)}=$$

$$=\lim_{x\to\infty}\frac{x^2-x-x^2\ /:x}{\sqrt{x^2-x}+x\ /:x}=\lim_{x\to\infty}\frac{-\frac{x}{x}}{\sqrt{\frac{x^2}{x^2}-\frac{x}{x^2}}+\frac{x}{x}}=\frac{-1}{1+1}=\frac{-1}{2}=-\frac{1}{2}$$

$$\boxed{b=-\frac{1}{2}}$$

$$y=kx+b$$

$$\boxed{y=2x-\frac{1}{2}}\quad\boxed{\text{je D.K.A}}\ \checkmark$$

4. $h(x) = \frac{x^2+4}{x^2-2}$

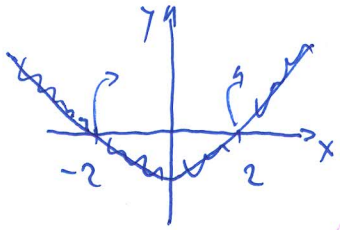
1. DOMENA:

U: $n \neq 0$

$x^2 - 2 \neq 0 \Rightarrow a > 0 \cup$

$x^2 \neq 2$

$x_1 \neq 2, \; x_1 \neq -2$



~~$D(f) = \langle -\infty, 2)$~~

$D(f) = \mathbb{R} \setminus \{-\sqrt{2}, \sqrt{2}\}$

2. NULTOČKE:

$x^2 + 4 = 0$

$x^2 = -4$

NEMA REALNOG RJEŠENJA !

3. EKSTREM, RAST, PAD F.:

$$h'(x) = \frac{2x(x^2-2) - (x^2+4)\cdot 2x}{(x^2-2)^2} = \frac{2x^3 - 4x - (2x^3+8x)}{(x^2-2)^2} = \frac{2x^3 - 4x - 2x^3 - 8x}{(x^2-2)^2} = \frac{-12x}{(x^2-2)^2} = 0$$

$-12x = 0 \;/:(-12)$

$x = 0$

$y = \frac{x^2+4}{x^2-2} = \frac{0^2+4}{0^2-2} = \frac{4}{-2} = -2$

$E(0, -2)$

	$-\infty$		-2		0		2		$+\infty$
$f'(x)$		$+$	$+$	$+$	$-$	$-$			
$f(x)$		↗	↗	↗	↘	↘			

$E(0, -2)$ MIAX

$f'(x) = \frac{-12x}{(x^2-2)^2}$: $-12x$: $+ \; + \; - \; -$; $(x^2-2)^2$: $+ \; + \; + \; +$

$f(x)$ RASTE ZA $x \in \langle -\infty, -2 \rangle \cup \langle -2, 0 \rangle$

$f(x)$ PADA ZA $x \in \langle 0, 2 \rangle \cup \langle 2, +\infty \rangle$

$$h''(x) = \frac{-12(x^2-2)^2 - (-12x)(2(x^2-2)\cdot 2x)}{((x^2-2)^2)^2} = \frac{-12(x^4 - 4x^2 + 4) - (-12x(4x^3 - 8x))}{(x^2-2)^4} = \frac{-12x^4 + 48x^2 - 48 + 48x^4 - 96x^2}{(x^2-2)^4}$$

6.

$$\begin{bmatrix} -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \overset{\cdot(-1)}{\sim} \begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \overset{III+I}{\sim} \begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & +1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \overset{IV-II}{\sim} \begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & 2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \sim$$

$$\begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & -4 & 4 & -3 \\ 0 & 0 & -4 & 4 & 3 \end{bmatrix} \overset{III-IV}{\sim} \begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & 0 & 0 & -6 \\ 0 & 0 & -4 & 4 & 3 \end{bmatrix} \overset{:(-6)}{\sim} \begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & -4 & 4 & 3 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \overset{III+II}{\sim}$$

$$\begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & +1 & 0 & 2 & 4 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \overset{I+2II}{\sim} \begin{bmatrix} 1 & 0 & 8 & -2 & 2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & 2 & 4 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \overset{III-II}{\sim} \begin{bmatrix} 1 & 0 & 8 & -2 & 2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & -4 & 4 & 3 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \sim \cdot(-4)$$

$$\begin{bmatrix} 1 & 0 & 8 & -2 & 2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & 1 & -1 & -\frac{3}{4} \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{matrix} I-2IV \\ II-IV \\ III+\frac{3}{4}IV \end{matrix} \sim \begin{bmatrix} 1 & 0 & 8 & -2 & 0 \\ 0 & 1 & 4 & -2 & 0 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{matrix} I-8III \\ II-4III \end{matrix} \sim \begin{bmatrix} 1 & 0 & 0 & 6 & 0 \\ 0 & 1 & 0 & 2 & 0 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} I$$

$\boxed{r = 2}$ ✗

4 ASIMPTOTE

MISLAV ROGOZNICA

4. ASIMPTOTE:

V.A.

$$\lim_{x\to 2}\frac{x^2+4}{x^2-2}=\frac{2^2+4}{2^2-2}=\frac{4+4}{4-2}=\frac{8}{2}=4$$

$$\lim_{x\to -2}\frac{x^2+4}{x^2-2}=\frac{(-2)^2+4}{(-2)^2-2}=\frac{4+4}{4-2}=\frac{8}{2}=4$$

> NEMA V.A.

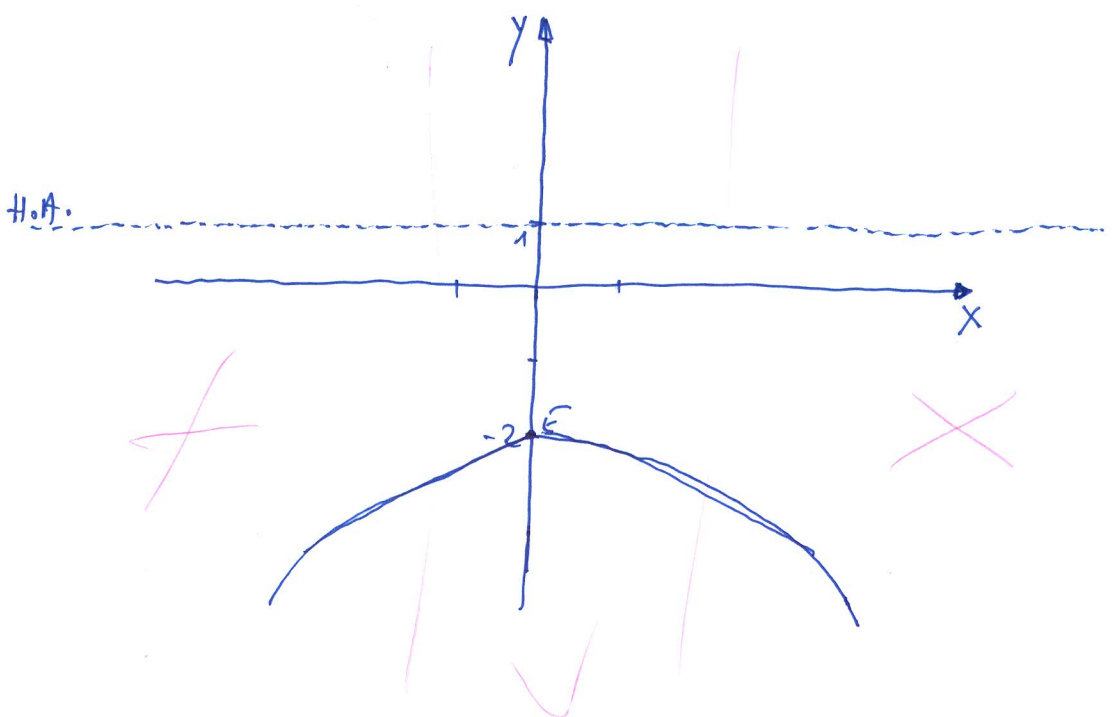
H.A.

$$\lim_{x\to\pm\infty}\frac{x^2+4}{x^2-2}\ /:x^2=\lim_{x\to\pm\infty}\frac{\frac{x^2}{x^2}+\frac{4}{x^2}}{\frac{x^2}{x^2}-\frac{2}{x^2}}=\frac{1+0}{1-0}=\frac{1}{1}=1$$

$$\lim_{x\to-\infty}\frac{x^2+4}{x^2-2}=\left[\begin{matrix}x\to(-x)\\ -\infty\to+\infty\end{matrix}\right]=\lim_{x\to\infty}\frac{(-x)^2+4}{(-x^2)-2}=\lim_{x\to\infty}\frac{x^2+4}{x^2-2}\ /:x^2=\frac{1+\frac{4}{x^2}}{1-\frac{2}{x^2}}=1$$

$y=1$ JE H.A.

ILOSE ASIMPTOTE NEMA!



$$x+2y-z+u=1$$
$$2x+5y-z+2u=-2$$
$$3x-y-2z+u=5$$
$$x-y+3z-5u=6$$

$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 2 & 5 & -1 & 2 & -2 \\ 3 & -1 & -2 & 1 & 5 \\ 1 & -1 & 3 & -5 & 6 \end{array}\right] \begin{array}{l} \text{II}-2\text{I} \\ \text{III}-3\text{I} \\ \text{IV}-\text{I} \end{array} \sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 0 & 1 & 1 & 0 & -4 \\ 0 & -7 & 1 & -2 & 2 \\ 0 & -3 & 4 & -6 & 5 \end{array}\right] \begin{array}{l} \text{III}+7\text{II} \\ \text{IV}+3\text{II} \end{array} \sim$$

$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 0 & 1 & 1 & 0 & -4 \\ 0 & 0 & 8 & -2 & -26 \\ 0 & 0 & 7 & -6 & -7 \end{array}\right] \begin{array}{l} \\ \\ :8 \\ \\ \end{array} \sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 0 & 1 & 1 & 0 & -4 \\ 0 & 0 & 1 & -\frac{2}{8} & -\frac{13}{4} \\ 0 & 0 & 7 & -6 & -7 \end{array}\right] \begin{array}{l} \\ \\ \\ \text{IV}-7\text{III} \end{array} \sim$$

$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 0 & 1 & 1 & 0 & -4 \\ 0 & 0 & 1 & -\frac{1}{4} & -\frac{13}{4} \\ 0 & 0 & 0 & -\frac{31}{4} & \frac{63}{4} \end{array}\right]$$

$$X=\begin{bmatrix} x \\ y \\ z \\ u \end{bmatrix} = \begin{bmatrix} \frac{15}{17} \\ -\frac{3}{17} \\ -\frac{71}{17} \\ -\frac{63}{17} \end{bmatrix}$$

PROVJERA:

$$x+2y-z+u=1$$
$$\frac{15}{17}-2\cdot\left(-\frac{3}{17}\right)-\left(-\frac{71}{17}\right)-\frac{63}{17}=1$$
$$\frac{15-6+71-63}{17}=1$$
$$\frac{17}{17}=1$$
$$\boxed{1=1}$$

$$x+2y-z+u=1 \Rightarrow x=1-2y+z-u$$
$$y+z=-4$$
$$z+\frac{1}{4}u=-\frac{13}{4}$$
$$-\frac{31}{4}u=\frac{63}{4} \quad /:\left(-\frac{31}{4}\right)$$
$$\boxed{u=\frac{\frac{63}{4}}{-\frac{31}{4}}=-\frac{63}{31}}$$

$$x=1-2\cdot\left(-\frac{3}{17}\right)-\frac{71}{17}+\frac{63}{17}-$$
$$=1+\frac{6}{17}-\frac{71}{17}+\frac{63}{17}=\frac{17+6-71+63}{17}=\frac{15}{17}$$

$$z=-\frac{13}{4}+\frac{1}{4}u=-\frac{13}{4}+\frac{1}{4}\cdot\left(-\frac{63}{31}\right)$$
$$=-\frac{13}{4}-\frac{63}{124}=\frac{-403-63}{124}=\frac{-221-63}{68}=-\frac{71}{17}$$

$$y=-4-z=-4+\frac{71}{17}=\frac{-68+71}{17}=\frac{3}{17}=-\frac{3}{17}$$

$$x=1-2y+z-u=1+\frac{6}{17}+\frac{71}{68}+\frac{63}{31}$$
$$=\frac{68+204-115+252}{68}=\frac{509}{68}$$

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇊ C1

IME I PREZIME: Jure Gonda

BROJ INDEKSA: 17-2-0326-2013 0269081799

POPUNJAVA NASTAVNIK
Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 + \overline{i-1} = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 15+3

2. Gaussovom metodom riješi sustav linearnih jednadžbi, a zatim provjeri uvrštavanjem:

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4. Ispitati tok i nacrtati graf funkcije: $h(x) = \frac{x^2+4}{x^2-2}$. 20(graf)

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6. Izračunati rang matrice: $\begin{bmatrix} -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix}$. 8

Ukupno: 35

JURE GENDA

3. $g(x) = \sqrt{x^2 - x} + x$

$x^2 - x \geq 0$

$x \geq 1$
$x \leq 0$

$D_x \langle -\infty, 0] \cup [1, \infty \rangle$ ✓

NEMA VERTIKALNIH ASIMPTOTA

$\lim_{x \to -\infty} g(x) = \lim \sqrt{x^2 - x} + x = \frac{1}{2}$ → HORIZONTALNA ASIMPTOTA ✓

$\lim_{x \to +\infty} \frac{g(x)}{x} = \frac{\sqrt{x^2 - x} + x \;/:x}{x \;\; /:x} = \frac{\sqrt{x^2 - 1} + 1}{1} = 2 = k$

$\lim (f(x) - kx) = l \rightarrow \lim \sqrt{x^2 - x} + x = -\frac{1}{2} \vee /:x = \frac{1}{2}$

$y = kx + l$

$y = 2x - \frac{1}{2}$ → KOSA ASIMPTOTA ✓

5. $f(x) = \ln(\cos(4x - 2))$

$(\ln(\cos(4x-2)))' = \frac{1}{\cos(4x-2)} \cdot (\cos(4x-2))' =$

$= \frac{1}{\cos(4x-2)} \cdot (-\sin(4x-2)) \cdot (4x-2)' =$

$= \frac{1}{\cos(4x-2)} \cdot (-\sin(4x-2)) \cdot 4$ ✓

4. $h(x) = \frac{x^2 + 4}{x^2 - 2}$

NULTOČKE → $\frac{x^2+4}{x^2-2} = 0$ $\quad x^2 + 4 = 0$ $\quad$ NEMA NULTOČAKA U $\mathbb{R}$

$x_1 = -2$

$x_2 = 2$

DOMENA $\quad x^2 - 2 \neq 0$ $\quad D = \mathbb{R} \setminus \{\sqrt{2}\}$

$x \neq \sqrt{2}$

EKSTREMI

$f'(x)=0 \quad \left(\frac{x^2+4}{x^2-2}\right)'=0$

$$\frac{(x^2+4)' \cdot (x^2-2) - (x^2-2)' \cdot (x^2+4)}{(x^2-2)^2} = \frac{2x(x^2-2) - 2x(x^2+4)}{(x^2-2)^2} = \frac{2x^3 - 4x - 2x^3 - 8x}{x^4-4x^2+4} =$$

$$= \frac{-12x}{x^4-4x^2+4} \longrightarrow -12x = 0 \qquad y = \frac{0+4}{0-2} = -\frac{4}{2} = -2$$

$x = 0$

TJEME $(0,-2)$

GRAF?

~~LOZINKA ZA KVIZOVE #1: PRVI~~

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IME I PREZIME: KARLO KOLJAJA **BROJ INDEKSA:** 0269087607

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Ukupno: 8

6. $\begin{bmatrix} -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \leftarrow + \sim \begin{bmatrix} -1 & -2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & -2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \leftarrow +$ $1\cdot(-1)$

$\sim \begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & -2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \begin{matrix} \\ \\ \\ 1\cdot 2 \end{matrix} \leftarrow + \sim \begin{bmatrix} 1 & 0 & 0 & -2 & -4 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & -2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \leftarrow +$

$\sim \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & -2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix}$ $\begin{bmatrix} 1 & -2 & 0 & 2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & -2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \leftarrow +$ $1\cdot 2 \sim \begin{bmatrix} 1 & 0 & 8 & -2 & 2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & -2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} + (-1)$ $\swarrow +$

$= \begin{bmatrix} 1 & 0 & 8 & -2 & 2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & -4 & 0 & -3 \\ 0 & 0 & -4 & 4 & 3 \end{bmatrix} \begin{matrix} \\ \\ \\ \cdot(-\frac{1}{4}) \end{matrix} \sim \begin{bmatrix} 1 & 0 & 8 & -2 & 2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & 1 & 0 & \frac{3}{4} \\ 0 & 0 & 4 & 4 & 3 \end{bmatrix} \leftarrow + \begin{matrix} \\ \\ \\ 1\cdot(-8) \end{matrix} \sim \begin{bmatrix} 1 & 0 & 0 & 16 & -14 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & 1 & 0 & \frac{3}{4} \\ 0 & 0 & -4 & 4 & 3 \end{bmatrix} \leftarrow + \begin{matrix} \\ \\ \\ 1\cdot(-4) \end{matrix}$

$\sim \begin{bmatrix} 1 & 0 & 0 & 16 & -14 \\ 0 & 1 & 0 & -2 & -6 \\ 0 & 0 & 1 & 0 & \frac{3}{4} \\ 0 & 0 & -4 & 4 & 3 \end{bmatrix} \begin{matrix} \\ \\ \\ 1\cdot 4 \end{matrix} \leftarrow + \sim \begin{bmatrix} 1 & 0 & 0 & 16 & -14 \\ 0 & 1 & 0 & -2 & -6 \\ 0 & 0 & 1 & 0 & \frac{3}{4} \\ 0 & 0 & 0 & 4 & 10 \end{bmatrix} \begin{matrix} \\ \\ \\ 1\cdot\frac{1}{4} \end{matrix} \sim \begin{bmatrix} 1 & 0 & 0 & 16 & -14 \\ 0 & 1 & 0 & -2 & -6 \\ 0 & 0 & 1 & 0 & \frac{3}{4} \\ 0 & 0 & 0 & 1 & \frac{5}{2} \end{bmatrix}$

$r(A) = 4$ ✓

2.) $\left.\begin{array}{l} x+2y-z+u=1 \\ 2x+5y-z+2u=-2 \\ 3x-y-2z+u=5 \\ x-y+3z-5u=6 \end{array}\right|$

1.) $z^3+\overline{i-1}=0$

5 $f(x)=\ln(\cos(3x-2))=1$

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇓⇓ C1

POPUNJAVA NASTAVNIK Broj ↓ bodova

IME I PREZIME: MATEO REDIŠIĆ

BROJ INDEKSA: 001491

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 + \overline{i-1} = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 15+3

2. Gaussovom metodom riješi sustav linearnih jednadžbi, a zatim provjeri uvrštavanjem:

$$\begin{aligned} x + 2y - z + u &= 1 \\ 2x + 5y - z + 2u &= -2 \\ 3x - y - 2z + u &= 5 \\ x - y + 3z - 5u &= 6 \end{aligned}$$

Provjeri uvrštavanjem! 16+3

3. Ispitati domenu i sve asimptote funkcije $g(x) = \sqrt{x^2 - x} + x$. 5+15

4. Ispitati tok i nacrtati graf funkcije: $h(x) = \frac{x^2+4}{x^2-2}$. 20(graf)

5. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\cos(4x - 2))$. 15

6. Izračunati rang matrice: $\begin{bmatrix} -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix}$. 8

Ukupno:

1) $z^3 + \overline{i-1} = 0$

$z^3 - i + 1 = 0$

$z^3 = -1 + i$

$r = \sqrt{x^2 + y^2}$

$r = \sqrt{2}$

$\varphi = \frac{1}{-1}$

$\varphi = 45° + \pi$

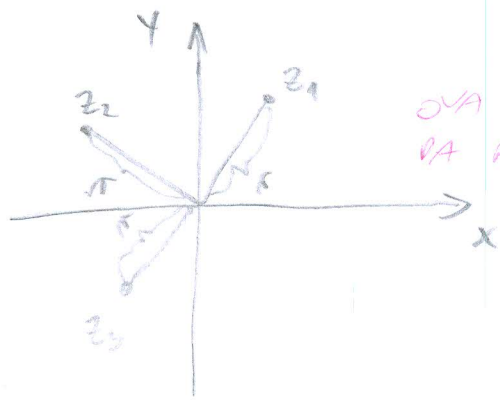
$\varphi = 45° + 180° = 225°$

$z^3 = r(\cos\varphi + i\sin\varphi)$

$z_1 = \sqrt[3]{(\sqrt{2})}\left(\cos\frac{225}{3} + i\sin\frac{225}{3}\right) = 0{,}29 + 1{,}08\,i$

$z_2 = \sqrt[3]{(\sqrt{2})}\left(\cos\frac{225+2\pi}{3} + i\sin\frac{225+2\pi}{3}\right) = -0{,}79 + 0{,}79\,i$

$z_3 = \sqrt[3]{(\sqrt{2})}\left(\cos\frac{225+2\pi\cdot 2}{3} + i\sin\frac{225+2\pi\cdot 2}{3}\right) = -1{,}08 - 0{,}29\,i$



OVA SLIKA POKAZUJE DA RJEŠENJE NIJE DOBRO!

2.)

$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 2 & 5 & -1 & 2 & -2 \\ 3 & -1 & -2 & 1 & 5 \\ 1 & -1 & 3 & -5 & 6 \end{array}\right] \begin{matrix} \\ /(-2) \\ /(-3) \\ /(-1) \end{matrix} \sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 0 & 1 & 1 & 0 & -4 \\ 0 & -7 & 1 & -2 & 2 \\ 0 & -3 & 4 & -6 & 5 \end{array}\right] \begin{matrix} \\ /(-2) \\ /(7) \\ /3 \end{matrix}$$

$$\sim \left[\begin{array}{cccc|c} 1 & 0 & -3 & 1 & 9 \\ 0 & 1 & 1 & 0 & -4 \\ 0 & 0 & 8 & -2 & -26 \\ 0 & 0 & 7 & -12 & 11 \end{array}\right] /:8 \sim \left[\begin{array}{cccc|c} 1 & 0 & -3 & 1 & 9 \\ 0 & 1 & 1 & 0 & -4 \\ 0 & 0 & 1 & -\frac{1}{4} & -\frac{13}{4} \\ 0 & 0 & 7 & -12 & 11 \end{array}\right] \begin{matrix} \\ \\ /(-7) \\ /(+1) \end{matrix} /3 \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & \frac{1}{4} & -\frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} & -\frac{3}{4} \\ 0 & 0 & 1 & -\frac{1}{4} & -\frac{13}{4} \\ 0 & 0 & 0 & -10{,}25 & 33{,}75 \end{array}\right] /(-10{,}25)$$

$$\sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & \frac{1}{4} & -\frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} & -\frac{3}{4} \\ 0 & 0 & 1 & -\frac{1}{4} & -\frac{13}{4} \\ 0 & 0 & 0 & 1 & -3{,}29 \end{array}\right] \begin{matrix} \\ \\ \\ /\left(-\frac{1}{4}\right) \cdot /\frac{1}{4} \end{matrix} \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 0{,}0725 \\ 0 & 1 & 0 & 0 & 0{,}0725 \\ 0 & 0 & 1 & 0 & -4{,}0725 \\ 0 & 0 & 0 & 1 & -3{,}29 \end{array}\right] \begin{matrix} \Rightarrow x = 0{,}0725 \\ \Rightarrow y = 0{,}0725 \\ \Rightarrow z = -4{,}0725 \\ \Rightarrow u = -3{,}29 \end{matrix}$$

$1 \cdot 0{,}0725 + 2 \cdot 0{,}0725 - 1 \cdot (-4{,}0725) + 1(-3{,}29) = 1$

$2 \cdot 0{,}0725 + 5 \cdot 0{,}0725 - 1 \cdot (-4{,}0725) + 2 \cdot (-3{,}29) = -2$

$3 \cdot 0{,}0725 - 1 \cdot 0{,}0725 - 2 \cdot (-4{,}0725) + 1 \cdot (-3{,}29) = 5$

$1 \cdot 0{,}0725 - 1 \cdot 0{,}0725 + 3 \cdot (-4{,}0725) - 5 \cdot (-3{,}29) = 6$

MATEO PEDIŠIĆ

3.) $g(x) = \sqrt{x^2 - x} + x$

$D_f = \mathbb{R}$

DOMENA SU SVI REALNI BROJEVI

V.A - NE POSTOJI JER NEMA PREKIDA U DOMENI

H.A -

$$\lim_{x \to +\infty} \sqrt{x^2 - x} + x \Big/ = \frac{\sqrt{x^2}}{\sqrt{x^2}} \; \frac{\sqrt{x^2 - x}}{\sqrt{x^2}} + \frac{x}{\sqrt{x^2}} = -1$$

V. A $y = -1$

4.) $h(x) = \frac{x^2 + 4}{x^2 - 2}$

$x^2 - 2 \neq 0$

$x^2 = 2 \; / \sqrt{}$

$x = \sqrt{2}$

$x_1 = 1{,}41$

$x_2 = -1{,}41$

$D_f = \langle -\infty, -1{,}41 \rangle \cup \langle -1{,}41, 1{,}41 \rangle \cup \langle 1{,}41, +\infty \rangle$

DESNA

V.A - $\lim_{x \to 1{,}41} \frac{x^2 + 4}{x^2 - 2} = \frac{(+\sqrt{2})^2 + 4}{(\sqrt{2})^2 - 2} = \frac{2 + 4}{2 - 2} = \frac{6}{0} = 0^+$

LIJEVA

$\lim_{x \to -1{,}41} \frac{x^2 + 4}{x^2 - 2} = \frac{2 + 4}{2 - 4} = \frac{6}{0} = 0^-$

NEMA V.A

H.A. $\lim\limits_{x\to\pm\infty} \dfrac{x^2+4 \;/:x^2}{x^2-2 \;/:x^2} = \dfrac{1+0}{1-0} = 1$

H.A JE $y = 1$

$$h(x) = \frac{x^2+4}{x^2-2}$$

$$h'(x) = \frac{(x^2+4)'\cdot(x^2-2) - (x^2+4)\cdot(x^2-2)'}{(x^2-2)^2} = \frac{2x\cdot(x^2-2) - (x^2+4)\cdot 2x}{(x^2-2)^2}$$

$$h'(x) = \frac{2x^3 - 4x - 2x^3 - 6x}{(x^2-2)^2} = \frac{-10x}{x^4-4x^2+4}$$

$-10x = 0 \;/:(-10)$

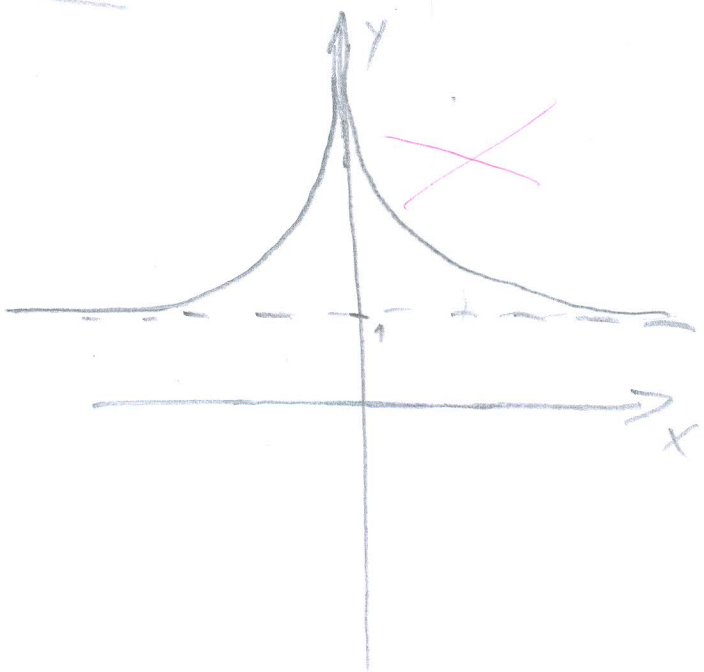
$x = 0$

$y = 0$

$$h''(x) = \frac{(-10x)'\cdot(x^4-4x^2+4) - (-10x)\cdot 4x^3 - 8x}{(x^4-4x^2+4)^2}$$

$$h''(x) = \frac{-10x^5 + 40x^3 - 40x + 40x^3 - 80x^2}{(x^4-4x^2+4)^2}$$

$$h''(x) = \frac{-10x^5 + 80x^3 - 80x^2 - 40x}{(x^4-4x^2+4)^2}$$



$-\infty$		$-\sqrt{2}$		0		$\sqrt{2}$		$+\infty$
	+		+		−		−	
	↗		↗		↓		↓	

MATEO PEDIĆ

6.) $\begin{bmatrix} 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 4 & -2 & 1 \\ -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \begin{matrix} (1) \\ \\ \\ \\ \end{matrix} \sim \begin{bmatrix} 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 1 & 0 & 2 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix} \begin{matrix} \\ \\ (-1) \\ (-1) \end{matrix}$

$\begin{bmatrix} 1 & 0 & 4 & 2 & -2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & -4 & 4 & -3 \\ 0 & 0 & 0 & 0 & 6 \end{bmatrix} \begin{matrix} \\ \\ :(-4) \\ \\ \end{matrix} \sim \begin{bmatrix} 1 & 0 & 4 & 2 & -2 \\ 0 & 1 & 4 & -2 & 1 \\ 0 & 0 & 1 & -1 & 0,75 \\ 0 & 0 & 0 & 0 & 6 \end{bmatrix}$

RANG MATRICE JE 3 ×

5.) $f(x) = \ln(\cos(4x-2))$

$f'(x) = \frac{1}{x}(-\sin 4)$

$f'(x) = \frac{-\sin 4}{x}$ ×

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇓⇓ C1

IME I PREZIME: TONI LULIĆ

BROJ INDEKSA: 0263053857

POPUNJAVA NASTAVNIK
Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 + \overline{i-1} = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 15+3

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$$\begin{aligned} x + 2y - z + u &= 1 \\ 2x + 5y - z + 2u &= -2 \\ 3x - y - 2z + u &= 5 \\ x - y + 3z - 5u &= 6 \end{aligned}$$

Provjeri uvrštavanjem! 16+3

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Ukupno: 5

(2.)
$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 2 & 5 & -1 & 2 & -2 \\ 3 & -1 & -2 & 1 & 5 \\ 1 & -1 & 3 & -5 & 6 \end{array}\right] \begin{array}{l} \text{II}-2\cdot\text{I} \\ \text{III}-\text{II} \\ \text{IV}-\text{I} \end{array} \sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 1 \\ 0 & 7 & 3 & 12 & 10 \\ 1 & -6 & -1 & -1 & 7 \\ 0 & -3 & 4 & -6 & 5 \end{array}\right] \begin{array}{l} \text{I}-\text{IV} \\ \text{II}-\text{IV} \\ \text{III}-\text{II} \end{array} \sim \left[\begin{array}{cccc|c} 1 & 5 & -5 & 5 & -4 \\ 0 & 10 & -1 & 18 & 5 \\ 1 & -13 & -4 & -13 & -3 \\ 0 & -3 & 4 & -6 & 5 \end{array}\right] \begin{array}{l} \text{II}-\text{I} \\ \text{III}-\text{IV} \end{array} \sim$$

$$\left[\begin{array}{cccc|c} 1 & 5 & -5 & 5 & -4 \\ -1 & 5 & 4 & 13 & 9 \\ 1 & 10 & -8 & 17 & -8 \\ 0 & -3 & 4 & -6 & 5 \end{array}\right] \begin{array}{l} \text{I}-\text{IV} \\ \cdot(-1) \\ \text{III}-\text{I} \end{array} \sim \left[\begin{array}{cccc} 1 & 8 & -9 & 11 \end{array}\right.$$

Ime i prezime: TONI LULIĆ **Broj indeksa:** 026905/3857

3. $y = \sqrt{x^2 - x} + x$

$x^2 - x = 0$

$x(x-1) = 0$

$x_1 = 0$

$x_2 = 1$

$Df: \langle -\infty, 0 \rangle \cup \langle 1, +\infty \rangle$ ✓

$\lim_{x \to 0^-} \sqrt{x^2 - x} + x = x^2 - x + x^2 = 2x^2 - x = -0 = 0$

$\lim_{x \to 0^+} \sqrt{x^2 - x} + x = x^2 - x + x^2 = 2x^2 - x = +0 = 0$

$\lim_{x \to 1^+} \sqrt{x^2 - x} + x = x^2 - x + 1 = x^{2 \to 0^+} - x^{\to 0^+} = +\infty$

$\lim_{x \to 1^-} \sqrt{x^2 - x} + x = x^2 - x - 1 = x^2 - x = -\infty$

$\lim \sqrt{x^2 - x} + x \cdot \frac{\sqrt{x^2 - x} - x}{\sqrt{x^2 - x} - x} =$

$\lim \frac{x^2 - x + x + x^2 - x - x}{\sqrt{x^2 - x} - x} =$

$\lim \frac{2x^{2 \to \infty} - 2x^{\to \infty}}{\sqrt{x^2 - x} - x} =$

$\lim \frac{+\infty - \infty}{+\infty - \infty - \infty} = \frac{-\infty}{-\infty} = +\infty$

4. $h(x) = \frac{x^2+4}{x^2-2}$

1. Domena

$x^2-2=0$

$x^2=2$

$x=\sqrt{2}$

$x=\pm\sqrt{2}$

Df: $\langle -\infty, -\sqrt{2} \rangle \cup \langle \sqrt{2}, +\infty \rangle$

2. $\frac{x^2+4}{x^2-2}=0 \quad / \cdot x^2-2$

$x^2+4=0$

$x^2=4 \quad / \sqrt{\ }$

$x=\sqrt{4}$

$x=\pm 2 //$ → V.A. → OBOSTRANA

GRAF?

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇊ C1

IME I PREZIME: BOŽENO VOLEGA **BROJ INDEKSA:** 17-1-0089-2011

POPUNJAVA NASTAVNIK
Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 + \overline{i-1} = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 15+3

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3. Ispitati domenu i sve asimptote funkcije $g(x) = \sqrt{x^2 - x} + x$. 5+15

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5. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\cos(4x - 2))$. 15

6. Izračunati rang matrice: $\begin{bmatrix} -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix}$. 8

Ukupno:

0

1) $z^3 + \overline{i-1} = 0$

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇊ C1

IME I PREZIME: ANTE SKOBLAR **BROJ INDEKSA:** 17-02-0132-11

POPUNJAVA NASTAVNIK Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 + \overline{i-1} = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 15+3

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Provjeri uvrštavanjem! 16+3

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4. Ispitati tok i nacrtati graf funkcije: $h(x) = \frac{x^2+4}{x^2-2}$. 20(graf)

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6. Izračunati rang matrice: $\begin{bmatrix} -1 & 2 & 0 & -2 & 0 \\ 0 & 1 & 4 & -2 & 1 \\ 1 & -1 & 0 & 4 & -2 \\ 0 & 1 & 0 & 2 & 4 \end{bmatrix}$. 8

Ukupno:

4. $h(x) = \frac{x^2+4}{x^2-2}$

NULTOČKE

$\frac{x^2+4}{x^2-2} = 0 \mid (x^2-2)$

$x^2+4=0$

$x^2=-4 \mid \sqrt{}$

$x = \pm i\sqrt{2}$

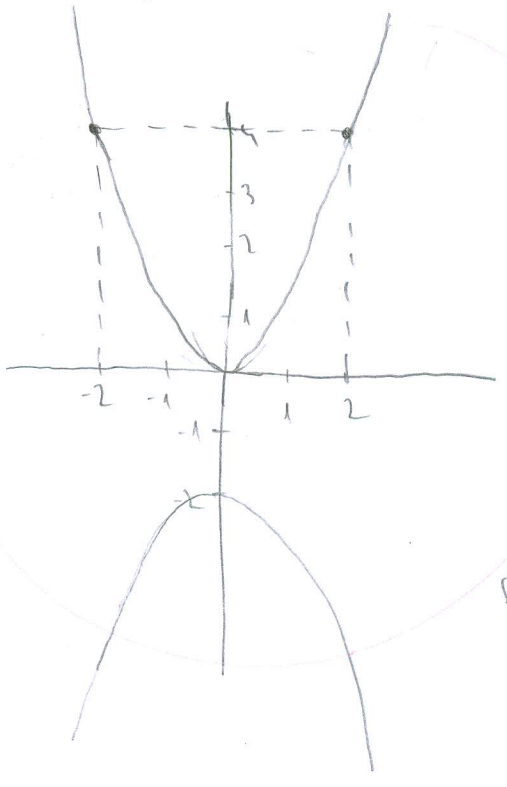
$D(f): x^2-2=0$

$x^2=2$

$x = \pm\sqrt{2}$

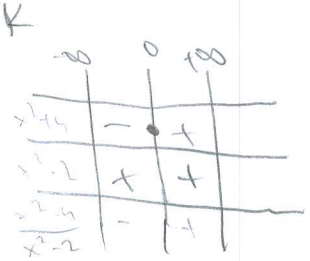
$D(f) = R \setminus \{-2\}$

x	-2	0	2
y	4	-2	4



$\frac{x^2+4}{x^2-2} \quad 1$

TOK



$f'(x) = \frac{x^2+4}{x^2-2} \; / \cdot x^2$

$= \frac{1+0}{1-0} = \frac{1}{1} = 0$

3. $g(x) = \sqrt{x^2 - x} + x$

$D(f) = \mathbb{R} \setminus \{0\}$

$k = \lim_{x \to -\infty} \frac{f(x)}{x} = \sqrt{x^2 - x} + x = \infty$

H.A. : $\pm\infty$

$y = mx + q$

as $x \to \infty$

$m = \lim_{x \to \infty} \frac{\sqrt{x^2 - x}}{x} = \frac{\infty}{\infty} = \lim_{x \to \infty} \frac{1 - \frac{1}{x}}{1} = 1$

$q = \lim_{x \to \infty} \left(\frac{x^2 - x}{\sqrt{x^2 - x}} \cdot \frac{\sqrt{x^2 - x}}{\sqrt{x^2 - x}} + x \right)$

$= \frac{x^2 - x\sqrt{x^2 - x}}{\sqrt{x^4 - x^2}} = \frac{x^2 - x\sqrt{x^2 - x}}{\sqrt{x^2(x^2 - 1)}} = \frac{x^2 - x\sqrt{x^2 - x}}{x(x^2 - 1)} \cdot \frac{0}{\infty} = 0$

$y = x \Rightarrow$ H.A. $+\infty$

$x \to -\infty$

$\lim_{x \to -\infty} = \lim_{x \to \infty} \frac{|x|}{x} = \lim_{x \to \infty} = \frac{-x}{x} = -1$

Ime i prezime: ANTE SKOBLAR

Broj indeksa: 17-02-0132-11

1. $z^3 + \overline{i-1} = 0$

$z^3 - 1 - i = 0$

$(x+yi)^3 - 1 - i = 0$

$(x+yi)^3 = 1+i$

$\overline{z} = i - 1$

$= -1 + i$

$= -1 - i$

$\hat{z} = (\sqrt{2})^3$

$\hat{z} = r(\cos\varphi + \sin\varphi)^n$

$\tan\varphi = \frac{1}{1} = 1 / \arctan$, $\varphi = \frac{\pi}{8}$

$|z| = r = \sqrt{x^2+y^2}$

$\tan\varphi = \frac{y}{x}$

$\arctan y = \frac{y}{x}$

$x = \sqrt{2}\cos\frac{\pi}{8}$

$x = 165$

$y = \sqrt{2}\sin\frac{\pi}{8}$

$y = 0.57$

$x = r\cos\varphi$

$y = r\sin\varphi$

5. $f(x) = \ln(\cos(4x-2))$

$\ln x = \frac{1}{x}$

$\cos x = -\sin x$

$f(x) = \ln(\cos(4x-2))$

$f'(x) = \frac{1}{\cos(4x-2)}$

$f'(x) = \frac{1}{-\sin(4x-2)}$

$f'(x) = \frac{1}{-\sin}$