MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇊ $\mathcal{D}2$

IME I PREZIME: TONI GRBIĆ **BROJ INDEKSA:** 0023098914

POPUNJAVA NASTAVNIK

Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 - 6 - 6i = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 12+3
2. Koji su globalni ekstremi funkcije $g(x) = \sqrt{6 - x^2}$ 10
3. Ispitati asimptote funkcije: $h(x) = \sqrt{x^2 - 2x} + x$. Zatim dovršiti ispitivanje toka i skicirati graf. 10(asimptote) 20(graf)
4. Odrediti i uvrštavanjem (kalkulator) provjeriti rezultat

   (a) $\lim\limits_{x\to 0}\left(\dfrac{\sqrt{6+x^2}-\sqrt{6}}{x}\right) =$ 7+2

   (b) $\lim\limits_{x\to \infty}\left(\dfrac{e^x+6}{e^x}\right) =$ 4+2

5. Riješi sustav Gaussovom metodom i obavezno provjeri rješenje: 15+5

$$\begin{aligned} 4x - y + z + 2u &= -1 \\ 2x + y - 3u &= 4 \\ x - y + 2z + u &= 2 \\ 2x + y + z - 4u &= 1 \end{aligned}$$

6. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\sin(2x^2 - 1))$. 10

Ukupno:

25

TONI GRBIĆ

① $z^3 - 6 - 6i = 0$

$z^3 = 6 + 6i$

$x = 6$

$y = 6$

$r = \sqrt{6^2 + 6^2}$

$r = 6\sqrt{2}$

$tg\varphi = \frac{6}{6} = 1$

$\varphi = 0{,}785$

$$\sqrt[n]{z} = \sqrt[n]{r}\left(\cos\frac{\varphi + 2k\pi}{n} + i\sin\frac{\varphi + 2k\pi}{n}\right)$$

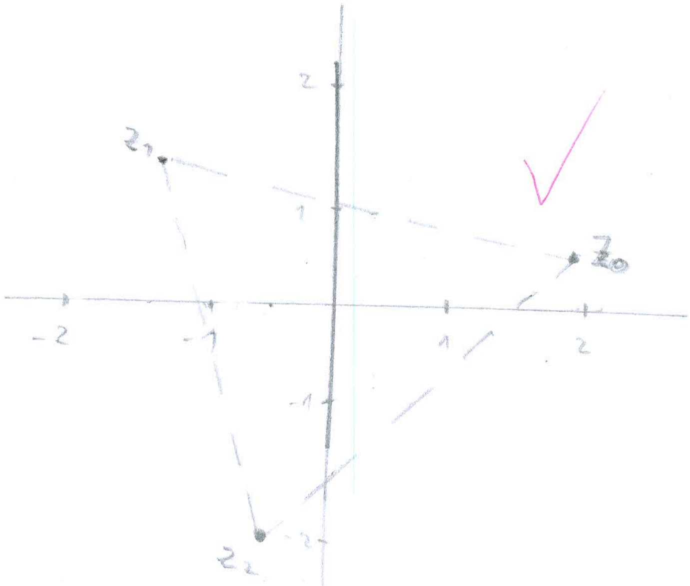
$$\sqrt[3]{z} = \sqrt[3]{6\sqrt{2}}\left(\cos\overbrace{\frac{0{,}785 + 2\cdot 0\cdot\pi}{3}}^{0{,}262} + i\sin 0{,}262\right)$$

$$\sqrt[3]{z} = 2{,}04\left(0{,}966 + i\,0{,}259\right)$$

$\boxed{z_0 = 1{,}97 + i\,0{,}528}$

$\boxed{z_1 = -1{,}44 + i\,1{,}44}$

$\boxed{z_2 = -0{,}53 - i\,1{,}97}$



⑥ $f(x) = \ln(\sin(2x^2 - 1))$

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

⑤

$$\left[\begin{array}{cccc|c} 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 0 & -3 & 4 \\ 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 0 & -3 & 4 \\ 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \begin{array}{l} \\ II-2I \\ \\ \\ \end{array}$$

$$\sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \begin{array}{l} \\ \\ III-4I \\ \\ \end{array} \sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \begin{array}{l} \\ \\ \\ IV-2I \end{array} \sim$$

$$\sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 3 & -3 & -6 & -3 \end{array}\right] \begin{array}{l} \\ \\ \\ IV-III \end{array} \sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 0 & 4 & -4 & 6 \end{array}\right] \begin{array}{l} \\ II-III \\ \\ \\ \end{array} \sim$$

$$\sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 0 & 3 & -3 & 9 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 0 & 4 & -4 & 6 \end{array}\right]$$

$3z - 3u = 9$

$3z = 9 + 3u \;/:3$

$z = 3 + u$

$\boxed{z = 3}$

$4(3+u) - 4u = 6$

$12 + \cancel{4u} - \cancel{4u} = 6$

$\boxed{u = 0}$

$3y - 7 \cdot 3 = -9$

$3y = -9 + 21$

$\boxed{Y = 4}$

PROVJERA

$0 - 4 + 6 = 2$

$2 = 2$ ✓

$x - 4 + 6 = 2$

$x = 2 - 2$

$\boxed{X = 0}$

Rj: $\begin{bmatrix} 0 \\ 4 \\ 3 \\ 0 \end{bmatrix}$

TOMI GRBIĆ

③ $h(x) = \sqrt{x^2 - 2x} + x$

1. DOMENA

$x^2 - 2x \geq 0$

$x \geq 0$

$x \geq 2$

$D_f \; [2, +\infty)$

$\frac{2 \pm \sqrt{4 - 4 \cdot 1 \cdot 0}}{2} = \frac{2 \pm 2}{2} = x_1 = \frac{0}{2} = 0$

$x_2 = 2$

1 a) $\lim\limits_{x\to 0}\left(\dfrac{\sqrt{6+x^2}-\sqrt{6}}{x}\right)=\left[\dfrac{0}{0}\right]$ $\quad \lim\limits_{x\to 0}^{L'H} \dfrac{\sqrt{2x}}{1} = 0$

b) $\lim\limits_{n\to \infty}\left(\dfrac{e^x+6}{e^x}\right)=\left[\dfrac{\infty}{\infty}\right]$

2 $g(x)=\sqrt{6-x^2}$

$g'(x)=\dfrac{1}{2\sqrt{6-x^2}}\cdot\dfrac{(-2x)}{1} = \dfrac{-2x}{2\sqrt{6-x^2}}$

N.T.

$X=0$

	$-\infty$	0	$+\infty$
$f'(x)$	$+$	$-$	
$f(x)$	$\nearrow$	$\searrow$	

$T_{max}=(0, \sqrt{6})$

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6. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\sin(2x^2 - 1))$. 10

Ukupno: 18

2. $g(x) = \sqrt{6-x^2}$

$g'(x) = \sqrt{6-x^2}' = \dfrac{1}{2\sqrt{6-x^2}} \cdot (6-x^2)' = \dfrac{1}{2\sqrt{6-x^2}} \cdot -2x = \dfrac{-2x}{2\sqrt{6-x^2}}$

$g'(x) = 0$ ZA $-2x = 0$ STACIONARNA TOČKA $(0, \sqrt{6})$ MAX ✓

$x = 0$

OSTALO ?

	$-\infty$ -1	0 1	$+\infty$
$f'(x)$	$+$	$-$	
$f(x)$	↗	↘	

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

$D_f \, x \in \langle -\infty, 0 \rangle \cup \langle 2, +\infty \rangle$

$x^2 - 2x > 0$

$x^2 - 2x = 0$

$x(x-2) = 0$

$x = 0 \quad x - 2 = 0$

$x = 2$

$\lim\limits_{x\to+\infty} \sqrt{x^2-2x} + x = \lim\limits_{x\to+\infty} \infty + \infty = \lim\limits_{x\to+\infty} \dfrac{\sqrt{x^2-2x}+x}{1} \cdot \dfrac{\sqrt{x^2-2x}-x}{\sqrt{x^2-2x}-x} \lim = \dfrac{x^2-2x-x^2}{\sqrt{x^2-2x}-x} \lim \dfrac{-2x : x}{\sqrt{x^2-2x}-x : x}$

$\lim\limits_{x\to\infty} \dfrac{-2}{\sqrt{1}-1} = \dfrac{-2}{0} = -\infty$ NEMA D.H.A. TRAŽIM KOSU

$$\lim_{x\to-\infty} \sqrt{x^2-2x}+x = \left[\begin{matrix} x\to -x \\ -\infty \to +\infty \end{matrix}\right] = \lim_{x\to-\infty} \sqrt{x^2+2x}-x = \infty-\infty = \lim_{x\to-\infty} \frac{\sqrt{x^2+2x}-x}{1}\cdot\frac{\sqrt{x^2+2x}+x}{\sqrt{x^2+2x}+x} \ {:x}$$

$$\lim_{x\to-\infty} \frac{\sqrt{1}+1}{\sqrt{1}+1} = \frac{2}{2} = 1 \quad \boxed{L.H.A \ y=1}$$

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

$$\lim_{x\to 0} \sqrt{x^2-2x}+x = \lim_{x\to 0} 0+0 = 0 \quad \boxed{V.A \ x=0}$$

$$\lim_{x\to+\infty} f(x)-ax = \lim_{x\to+\infty} \sqrt{x^2-2x}+x-2x = \lim_{x\to+\infty} \frac{\sqrt{x^2-2x}-x}{1}\cdot\frac{\sqrt{x^2-2x}+x}{\sqrt{x^2-2x}+x}$$

$$\lim_{x\to 2} \sqrt{x^2-2x}+x = \sqrt{0}+2 = 2 \quad \boxed{V.A \ x=2}$$

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

$$\boxed{D.K.A \ y=2x-1}$$

NULTOČKE

$x_1=0 \quad x_2=2$

RAST I PAD FUNKCIJE

$$f(x)' = \left(\sqrt{x^2-2x}+x\right)' = \frac{1}{2\sqrt{x^2-2x}}\cdot(x^2-2x)' = \frac{2x-2}{2\sqrt{x^2-2x}} + x' = \frac{2x-2}{2\sqrt{x^2-2x}} + \frac{1}{1} = \frac{2x-2+2\sqrt{x^2-2x}}{2\sqrt{x^2-2x}} = 2x-2$$

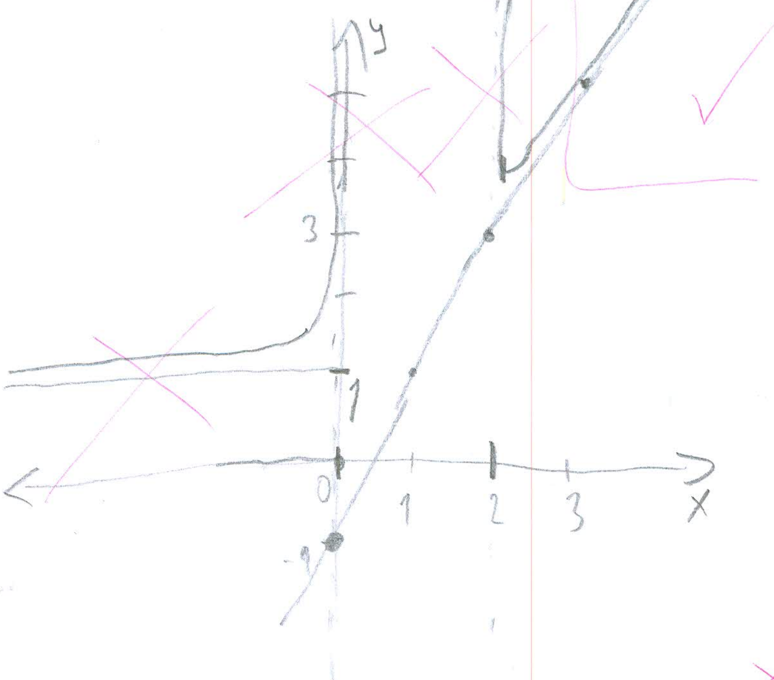
$f(x)'=0$

$2x-2=0$

$x=1$ NIJE U DOMENI

$x\in\langle-\infty,0\rangle\cup\langle 2,+\infty\rangle$

$f''(x) = (2x-2)' = 2>0$ f-ja je KONVEKSNA



$$4. \lim_{x\to 0} \frac{\sqrt{6+x^2}-\sqrt{6}}{x} = \frac{0}{0} \overset{L.H.}{=} \lim_{x\to 0} \frac{\sqrt{6+x^2}-\sqrt{6}}{x} = \lim_{x\to 0} \frac{\frac{1}{2\sqrt{6+x^2}}\cdot 2x}{1} = \frac{2x}{2\sqrt{6+x^2}} = \frac{2\cdot 0}{2\sqrt{6+x^2}} = \frac{0}{4.89} = +\infty$$

$$\lim_{x\to\infty} \frac{e^x+6}{e^x} = \frac{e^\infty+6}{e^\infty} = \frac{\infty}{\infty} = \lim_{x\to\infty} \frac{e^x+6}{e^x} \overset{L.H.}{=} \lim_{x\to\infty} \frac{e^{x\prime}+6'}{e^{x\prime}} = \frac{e^x}{e^x} = 1$$

5. $\left(\begin{array}{cccc|c} 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 0 & -3 & 4 \\ 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right) = \left(\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 0 & -3 & 4 \\ 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right) \begin{array}{l} R_2-2R_1 \\ R_3-4R_1 \\ R_4-2R_1 \end{array} = \left(\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 3 & -3 & -6 & -3 \end{array}\right) \cdot \frac{1}{3}$

$\left(\begin{array}{ccccc} 1 & -1 & 2 & 1 & 2 \\ 0 & 1 & -4/3 & -5/3 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 3 & -3 & -6 & -3 \end{array}\right) \begin{array}{l} R_1+R_2 \\ \\ R_3-3R_2 \\ R_4-3R_2 \end{array} = \left(\begin{array}{cccc|c} 1 & 0 & 2/3 & -2/3 & 2 \\ 0 & 1 & -4/3 & -5/3 & 0 \\ 0 & 0 & -11 & -7 & -9 \\ 0 & 0 & 1 & -1 & -3 \end{array}\right) \cdot -\frac{1}{11} = \left(\begin{array}{ccccc} 1 & 0 & 2/3 & -2/3 & 2 \\ 0 & 1 & -4/3 & -5/3 & 0 \\ 0 & 0 & 1 & 7/11 & 9/11 \\ 0 & 0 & 1 & -1 & -3 \end{array}\right) =$

$R_1 - 2/3R_3$

$\begin{array}{l} R_1-2/3R_3 \\ R_2+4/3R_3 \\ R_4-R_3 \end{array} = \left(\begin{array}{ccccc} 1 & 0 & 2/3 & -2/3 & 2 \\ 0 & 1 & -4/3 & -5/3 & 0 \\ 0 & 0 & 1 & 7/11 & 9/11 \\ 0 & 0 & 1 & -1 & -3 \end{array}\right) \begin{array}{l} R_1-2/3R_3 \\ R_2+4/3R_3 \\ \\ R_4-R_3 \end{array} \left(\begin{array}{cccc|c} 1 & 0 & 0 & -12/11 & 16/11 \\ 0 & 1 & 0 & -9/11 & 12/11 \\ 0 & 0 & 1 & 7/11 & 9/11 \\ 0 & 0 & 0 & -\frac{18}{11} & -42/11 \end{array}\right) \cdot -\frac{11}{18} =$

$\left(\begin{array}{cccc|c} 1 & 0 & 0 & -12/11 & 16/11 \\ 0 & 1 & 0 & -9/11 & 12/11 \\ 0 & 0 & 1 & 7/11 & 9/11 \\ 0 & 0 & 0 & 1 & 7/3 \end{array}\right) \begin{array}{l} R_1+12/11R_4 \\ R_2+9/11R_4 \\ R_3-7/11R_4 \end{array} = \left(\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 4 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 1 & 0 & -2/3 \\ 0 & 0 & 0 & 1 & 7/3 \end{array}\right)$ $\boxed{\begin{array}{l} x=4 \\ y=3 \\ z=-2/3 \\ v=7/3 \end{array}}$

6. $\ln(\sin(2x^2-1)) = \frac{1}{\sin(2x^2-1)} \cdot \cos(2x-1) \cdot 2 = \frac{2\cos(2x-1)}{\sin(2x-1)} = 2\mathrm{ctg}(2x-1)$

1. $z^3 - 6 - 6i = 0$

$z^3 = 6 + 6i$

$z = \sqrt[3]{6+6i}$

$z = r\sqrt{\cos\varphi + i\sin\varphi}$

$W_k = \sqrt[n]{r}\left(\cos\frac{\varphi + k\cdot 2\pi}{n} + i\sin\frac{\varphi + k\,2\pi}{n}\right)$

$r = \sqrt{6^2 + 6i^2} = \sqrt{36 - 6} = \sqrt{30} = \boxed{5.47 = r}$

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

$\varphi = \arctan\frac{6}{6} = \arctan 1 = \frac{\pi}{4}$

$z = 5.47\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$

$z = 5.47\left(\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}\right)$

$z = 5.47\cdot\left(\frac{1}{2}i\right)$

$z = 2.73i$

$n=0 \quad W_{k_1} = \sqrt[3]{5.47}\left(\cos\frac{\frac{\pi}{4}+0}{3} + i\sin\frac{\frac{\pi}{4}+0}{3}\right) = 1.76\left(\cos\frac{1}{12}\pi + i\sin\frac{1}{12}\pi\right) = 1.76(0.96 + 0.26i) = \underline{1.69 + 0.46i}$

$n=1 \quad W_{k_2} = \sqrt[3]{5.47}\left(\cos\frac{\frac{\pi}{4}+1\cdot 2\pi}{3} + i\sin\frac{\frac{\pi}{4}+1\cdot 2\pi}{3}\right) = 1.76\left(\cos\frac{3}{4}\pi + i\sin\frac{3}{4}\pi\right) = 1.76\left(-\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i\right) = -1.24 + 1.24i$

$n=2 \quad W_{k_3} = \sqrt[3]{5.47}\left(\cos\frac{\frac{\pi}{4}+4\pi}{3} + i\sin\frac{\frac{\pi}{4}+4\pi}{3}\right) = 1.76\left(\cos\frac{17}{12}\pi + i\sin\frac{17}{12}\pi\right) = 1.76(-0.26 - 0.96i) = \underline{-0.46 - 1.69i}$

DANIEL ŠOŠA

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Broj ↓ bodova

IME I PREZIME: LOVRE RADOVČIĆ

BROJ INDEKSA: 17-1-0177-2013

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5. Riješi sustav Gaussovom metodom i obavezno provjeri rješenje: 15+5

$$\begin{array}{rcrcrcrl} 4x & - & y & + & z & + & 2u = & -1 \\ 2x & + & y & & & - & 3u = & 4 \\ x & - & y & + & 2z & + & u = & 2 \\ 2x & + & y & + & z & - & 4u = & 1 \end{array}$$

6. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\sin(2x^2 - 1))$. 10

Ukupno: 10

6. $f'(x) = (\ln(\sin(2x^2-1)))'$

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

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

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

4. a) $\lim\limits_{x\to 0} \frac{\sqrt{6+x^2}-\sqrt{6}}{x} \cdot \frac{\sqrt{6+x^2}+\sqrt{6}}{\sqrt{6+x^2}+\sqrt{6}+x} = \frac{\sqrt{6+x^2}^2-\sqrt{6}^2}{\sqrt{6+x^2}+\sqrt{6}+x} = \frac{6+x^2-\sqrt{6}^2}{\sqrt{6+x^2}+\sqrt{6}+x} = \frac{6+x^2-6}{\sqrt{6+x^2}+\sqrt{6}+x}$

$$\frac{6+0^2-6}{\sqrt{6+0^2}+\sqrt{6}+0} = \frac{0}{2\sqrt{6}} = 0$$

b) $\lim\limits_{n\to\infty} \frac{e^x+6}{e^x} \begin{array}{l} /:x \\ /:x \end{array} = \frac{e}{e} = \infty$

IME I PREZIME:
LOVRE RADOVČIĆ

BROJ INDEKSA:
17-1-0177-2013

③ $h(x)=\sqrt{x^2-2x}+x$

DOMENA

$x^2-2x\geq 0$

$x(x-2)\geq 0$

$x=0$

$x-2=0$

$x=2$

	$-\infty$ … 0	0 … 2	2 … $+\infty$
x	$-$	$+$	$+$
$x-2$	$-$	$-$	$+$
	$\oplus$	$-$	$\oplus$

$D_f\ \langle -\infty, 0] \cup [2, +\infty\rangle$

V. A.

$\lim\limits_{x\to 0}\sqrt{0^2-2\cdot 0}=0$ V.A. NE POSTOJI

$\lim\limits_{x\to 2}\sqrt{2^2-2\cdot 2}=0.$

D.H.A.

$\lim\limits_{x\to+\infty}\sqrt{x^2-2x}+x\cdot\frac{\sqrt{x^2-2x}^2-x^2}{\sqrt{x^2-2x}-x}=\lim\limits_{x\to\infty}\frac{x^2-2x-x^2}{\sqrt{x^2-2x}-x}=\lim\limits_{x\to\infty}\frac{-2x\ /:x}{\sqrt{x^2-2x}-x\ /:x}=\frac{-2}{0}=+\infty$

D.H.A. NE POSTOJI

L.H.A.

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

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

L.H.A. $y=1$

D.K.A.

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

$l=\lim\limits_{x\to\infty}\sqrt{x^2-2x}+x-2x=\sqrt{x^2-2x}-x\cdot\frac{\sqrt{x^2-2x}+x}{\sqrt{x^2-2x}+x}=\frac{\sqrt{x^2-2x}^2+x^2}{\sqrt{x^2-2x}+x^2}=\frac{x^2-2x-x^2}{\sqrt{x^2-2x}-x^2}=\frac{-2x\ /:x}{\sqrt{x^2-2x}-x^2\ /:x}$

$=\frac{-2}{0}=\infty$ D.K.A. $y=2x$

L.K.A.

$$\lim_{x\to\infty}\frac{\sqrt{x^2-2x}+x}{x}=\frac{\sqrt{x^2+2x}-x \;/:x}{-x \;/:x}=\frac{0}{1}=0 \qquad k=0$$

NEMA L.K.A.

NULTOČKE

$f(x)=0$

$\sqrt{x^2-2x}+x=0 \;/^2$

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

$2x^2-2x=0$

$x(2x-2)=0$

$x=0$

$2x-2=0$

$2x=2 \;/:2$

$x=1$

$(0,0)$

$(1,0)$

SJECIŠTE S OSI y

$f(0)=\sqrt{0^2-2\cdot 0}-0=0$

$(0,0)$

NE(PARNOST)

$f(-x)=\sqrt{x^2+2x}-x$ NITI P NITI NP

DERIVACIJA

$$f'(x)=\left(\sqrt{x^2-2x}+x\right)'$$

$$=\frac{1}{2\sqrt{x^2-2x}}(x^2-2x)'+1=\frac{1}{2\sqrt{x^2-2x}}(2x-2)+1$$

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

KRITIČNE TOČKE

$2x-2=0$

$2x=2 \;/:1$

$x=1$

	$-\infty$ … 0 (−1)	0 … 1 (0,5)	1 … 2 (1,5)	2 … $+\infty$ (3)
$f'(x)$	−	−	+	+
$f(x)$	↘	↘	↗	↗

$\cup_{MIN}$

$f(1)=\sqrt{1^2-2}+1=1$

$(1,1)$

DRUGA DER

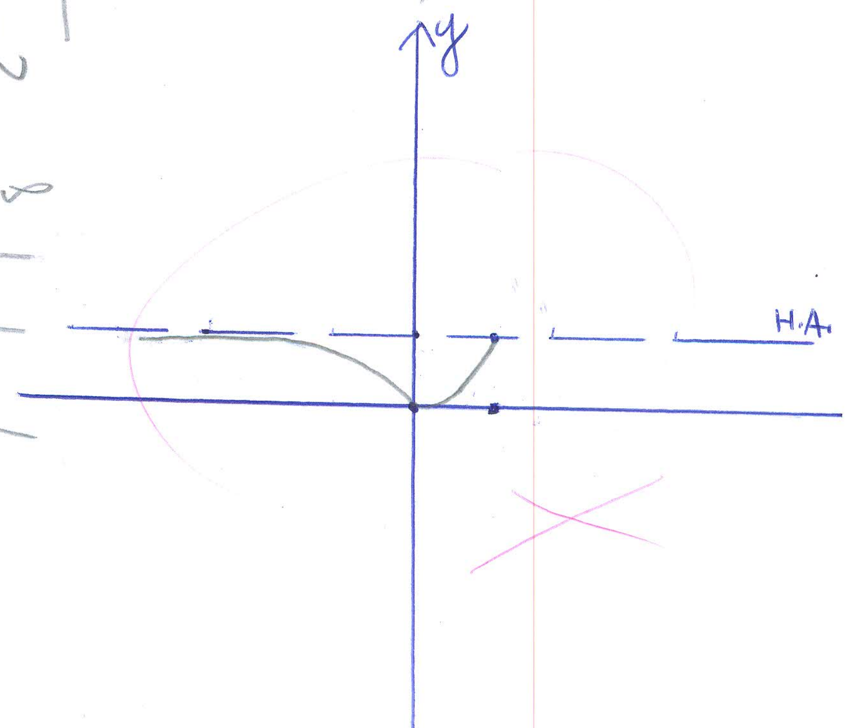
$f''(x)=(2x^2-2)''$

$=4x$

$4x=0$

$x=0$

	$-\infty$ … 0 (−1)	0 … 2 (1)	2 … $+\infty$ (3)
$f''(x)$	−	+	+
$f(x)$	$\cap$	$\cup$	$\cup$



Ime i prezime: LOVRE RADOVČIĆ

Broj indeksa: 17-1-0177-2013

② $g(x)=\sqrt{6-x^2}$

DOMENA

$6-x^2 \geq 0$

$-x^2 \geq -6 \mid \cdot(-1)$

$x^2 \leq 6$

$x \leq \pm\sqrt{6}$

	$-\infty$	$-\sqrt{6}$ -3	0	$+\sqrt{6}$ 3	$+\infty$
$6-x^2$	$-$	•	$+$	•	$-$

$D_f\,[-\sqrt{6}, \sqrt{6}]$

GLOBALNI EKSTREMI ?

$$g'(x)=\left(\sqrt{6-x^2}\right)'$$

$$=\frac{1}{2\sqrt{6-x^2}}\left(6-x^2\right)'$$

$$=\frac{1}{2\sqrt{6-x^2}}\cdot(-2x)=-\frac{2x}{2\sqrt{6-x^2}}=-\frac{x}{\sqrt{6-x^2}}$$

$$g''(x)=\left(\frac{-x}{\sqrt{6-x^2}}\right)'=\frac{(-x)'\sqrt{6-x^2}-(-x)\left(\sqrt{6-x^2}\right)'}{\left(\sqrt{6-x^2}\right)^2}$$

$$=\frac{-\sqrt{6-x^2}+x\cdot\frac{1}{2\sqrt{6-x^2}}}{\left(\sqrt{6-x^2}\right)^2}$$

$$=\frac{-\sqrt{6-x^2}+\frac{x}{2\sqrt{6-x^2}}}{\left(\sqrt{6-x^2}\right)^2}=\frac{\frac{-2\sqrt{6-x^2}^{\,2}+x}{2\sqrt{6-x^2}}}{\left(\sqrt{6-x^2}\right)^2}$$

$$=\frac{-2\sqrt{6-x^2}^{\,2}+2}{\left(2\sqrt{6-x^2}\right)^4}$$

DRUGA DERIVACIJA

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

$$=\frac{\left(2x-2+\sqrt{x^2-2x}\right)'\left(\sqrt{x^2-2x}\right)-\left(2x-2+\sqrt{x^2-2x}\right)\left(\sqrt{x^2-2x}\right)'}{\left(\sqrt{x^2-2x}\right)^2}$$

$$=\frac{2+\frac{1}{2\sqrt{x^2-2x}}\left(x^2-2x\right)'\cdot\sqrt{x^2-2x}-\left(2x-2+\sqrt{x^2-2x}\right)\left(\frac{1}{2\sqrt{x^2-2x}}\right)\left(x^2-2x\right)'}{\left(\sqrt{x^2-2x}\right)^2}$$

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

$$=\frac{\left(2x-2\right)\left(\frac{4\sqrt{x^2-2x}+1}{2\sqrt{x^2-2x}}\cdot\sqrt{x^2-2x}-\frac{2x-2+\sqrt{x^2-2x}}{2\sqrt{x^2-2x}}\right)}{\left(\sqrt{x^2-2x}\right)^2}$$

$$=\frac{\left(2x-2\right)\left(\frac{4\sqrt{x^2-2x}+1+\sqrt{x^2-2x}}{2\sqrt{x^2-2x}}-\frac{2x-2+\sqrt{x^2-2x}}{2\sqrt{x^2-2x}}\right)}{\left(\sqrt{x^2-2x}\right)^2}$$

$$=\frac{\left(2x-2\right)\left(\frac{4\sqrt{x^2-2x}+1+\sqrt{x^2-2x}-2x-2+\sqrt{x^2-2x}}{2\sqrt{x^2-2x}}\right)}{\left(\sqrt{x^2-2x}\right)^2}$$

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇊ D2 **IME I PREZIME:** Ante Kasipović **BROJ INDEKSA:** 17-2-0403-2016	POPUNJAVA NASTAVNIK Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 - 6 - 6i = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 12+3
2. Koji su globalni ekstremi funkcije $g(x) = \sqrt{6 - x^2}$ 10
3. Ispitati asimptote funkcije: $h(x) = \sqrt{x^2 - 2x} + x$. Zatim dovršiti ispitivanje toka i skicirati graf. 10(asimptote) 20(graf)
4. Odrediti i uvrštavanjem (kalkulator) provjeriti rezultat

   (a) $\lim\limits_{x\to 0}\left(\dfrac{\sqrt{6+x^2}-\sqrt{6}}{x}\right) =$ 7+2

   (b) $\lim\limits_{n\to\infty}\left(\dfrac{e^x+6}{e^x}\right) =$ 4+2

5. Riješi sustav Gaussovom metodom i obavezno provjeri rješenje: 15+5

$$\begin{array}{rcrcrcrl} 4x & - & y & + & z & + & 2u = & -1 \\ 2x & + & y & & & - & 3u = & 4 \\ x & - & y & + & 2z & + & u = & 2 \\ 2x & + & y & + & z & - & 4u = & 1 \end{array}$$

6. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\sin(2x^2 - 1))$. 10

Ukupno: ∅

1.

5.

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod⇊ $\mathcal{D}2$

IME I PREZIME: ANDREA KAMBER **BROJ INDEKSA:** 17-2-0418-2014

POPUNJAVA NASTAVNIK

Broj ↓ bodova

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 - 6 - 6i = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 12+3
2. Koji su globalni ekstremi funkcije $g(x) = \sqrt{6 - x^2}$ 10
3. Ispitati asimptote funkcije: $h(x) = \sqrt{x^2 - 2x} + x$. Zatim dovršiti ispitivanje toka i skicirati graf. 10(asimptote) 20(graf)
4. Odrediti i uvrštavanjem (kalkulator) provjeriti rezultat
   (a) $\lim\limits_{x\to 0}\left(\dfrac{\sqrt{6+x^2}-\sqrt{6}}{x}\right) =$ 7+2
   (b) $\lim\limits_{n\to\infty}\left(\dfrac{e^x+6}{e^x}\right) =$ 4+2
5. Riješi sustav Gaussovom metodom i obavezno provjeri rješenje: 15+5

$$\begin{array}{rcrcrcrl}
4x & - & y & + & z & + & 2u = & -1 \\
2x & + & y & & & - & 3u = & 4 \\
x & - & y & + & 2z & + & u = & 2 \\
2x & + & y & + & z & - & 4u = & 1
\end{array}$$

6. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\sin(2x^2 - 1))$. 10

Ukupno: $\emptyset$

1. $z^3 - 6 - 6i = 0$ $a = 1, b = -6, c = -6$

$x_{1,2} = \dfrac{1 \pm \sqrt{(-6)^2 - 4\cdot 1\cdot(-6)}}{2\cdot 1}$

$\emptyset$

$x_{1,2} = \dfrac{1 \pm \sqrt{36 + 24}}{2}$

$x_{1,2} = \dfrac{1 \pm \sqrt{60}}{2}$

$x_{1,2} = \dfrac{1 + \sqrt{60}}{2} = 4{,}37$

$x_2 = \dfrac{1 - \sqrt{60}}{2} = -3{,}37$

2.

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

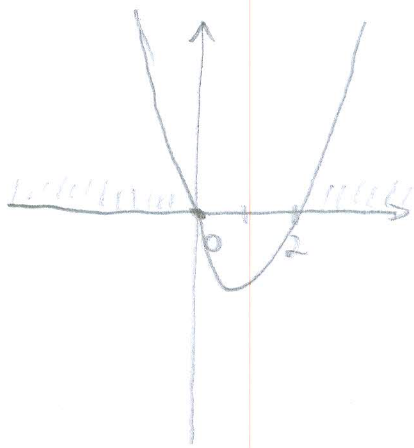
DOMENA: $x^2-2x \geq 0$

$x\cdot(x-2)=0$

$x_1=0$

$x-2=0$

$x_2=2$



$D(f): \langle -\infty, 0] \cup [2, +\infty\rangle$

VERTIKALNE AS:

$\cancel{f(x)} \lim_{x\to 0} \sqrt{x^2-2x}+x = \sqrt{0^2-2\cdot 0}+0 = 0$

NEMA LIJEVU NI DESNU VERTIKALNU ASIMPTOTU

$f(x) \lim_{x\to 2} \sqrt{x^2-2x}+x = \sqrt{2^2-2\cdot 2}+2 = \sqrt{4-4}+2 = \sqrt{0}+2 = 2$

HORIZONTALNA AS:

$$\lim_{x\to+\infty} \sqrt{x^2-2x}+x \cdot \frac{\sqrt{x^2-2x}-x}{\sqrt{x^2-2x}-x} = \frac{(\cancel{\sqrt{}}x^2-2x-x)^2}{\sqrt{x^2-2x}-x} = \frac{x^2-2x-\cancel{x}}{\sqrt{x^2-2x}-x} \begin{matrix} :x^2 \\ :x^2 \end{matrix}$$

$$\lim_{x\to+\infty} = \frac{\frac{x^2}{x^2}-\frac{2x}{x^2}-\frac{x}{x^2}}{\sqrt{\frac{x^2}{x^2}-\frac{2x}{x^2}}-\frac{x}{x^2}} = \frac{1-0-0}{\sqrt{1-0}-0} = \frac{1}{1} = 1 \to \text{DESN H.A.}$$

3. LIJEVA H. A

ANDRIJA KATIBER

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

$$\lim_{x \to +\infty} \sqrt{(-x)^2-2\cdot(-x)} - x$$

$$\sqrt{x^2+2x} - x \cdot \frac{\sqrt{x^2+2x}+x}{\sqrt{x^2+2x}+x} = \frac{(\sqrt{\cancel{x^2+2x}} - x)^{\cancel{2}}}{\sqrt{x^2+2x}+x}$$

$$\lim_{x \to +\infty} = \frac{x^2+2x-x}{\sqrt{x^2+2x}+x} \begin{array}{l} : x^2 \\ : x^2 \end{array}$$

$$= \frac{\frac{x^2}{x^2} + \frac{2x}{x^2} - \frac{x}{x^2}}{\sqrt{\frac{x^2}{x^2} + \frac{2x}{x^2}} + \frac{x}{x^2}} = \frac{1+0-0}{\sqrt{1+0}+0} = 1$$

DESNA

NEMA KOSE ASIMPTOTE.

$\emptyset$

$$\left[\begin{array}{cccc|c} 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 0 & -3 & 4 \\ 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & -2 & 0 & -3 & -8 \\ 2 & 1 & 0 & -3 & 4 \\ 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \sim$$

2R · 2 : 1R

1R · (-2) + 2R
1R · (-1) + 3R
1R · (-2) + 4R

$$\left[\begin{array}{cccc|c} 1 & -2 & 0 & -3 & -8 \\ 0 & 5 & 0 & 3 & 20 \\ 0 & 1 & 2 & 4 & 10 \\ 0 & 5 & 1 & 2 & 17 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & -2 & 0 & -3 & -8 \\ 0 & 1 & 2 & 4 & 10 \\ 0 & 5 & 1 & 2 & 17 \\ 0 & 5 & 0 & 3 & 20 \end{array}\right] \sim$$

3R <-> 2R
4R <-> 3R

2R · 2 + 1R
2R · (-5) + 3R
2R · (-5) + 4R

$$\left[\begin{array}{cccc|c} 1 & 0 & 4 & 5 & 12 \\ 0 & 1 & 2 & 4 & 10 \\ 0 & 0 & -9 & -18 & -33 \\ 0 & 0 & -10 & -17 & -30 \end{array}\right] \begin{array}{l} \\ \\ \mid :(-1) \\ \mid :(-1) \end{array} \sim \left[\begin{array}{cccc|c} 1 & 0 & 4 & 5 & 12 \\ 0 & 1 & 2 & 4 & 10 \\ 0 & 0 & 9 & 18 & 33 \\ 0 & 0 & 10 & 17 & 30 \end{array}\right] \sim$$

4R - 3R

$$\left[\begin{array}{cccc|c} 1 & 0 & 4 & 5 & 12 \\ 0 & 1 & 2 & 4 & 10 \\ 0 & 0 & 1 & -1 & -3 \\ 0 & 0 & 10 & 17 & 30 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & 9 & 24 \\ 0 & 1 & 0 & 6 & 16 \\ 0 & 0 & 1 & -1 & -3 \\ 0 & 0 & 0 & 27 & 60 \end{array}\right] \sim$$

3R · (-2) + 2R   3R · (-4) + 1R   3R · (-10) + 4R

$$\sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & -8 & 4 \\ 0 & 1 & 0 & 13 & -4 \\ 0 & 0 & 1 & 11 & -3 \\ 0 & 0 & 0 & 36 & -18 \end{array}\right] /:18 \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & -8 & 4 \\ 0 & 1 & 0 & 13 & -4 \\ 0 & 0 & 1 & 11 & -3 \\ 0 & 0 & 0 & 2 & -1 \end{array}\right] :2 \sim$$

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & -8 & 4 \\ 0 & 1 & 0 & 13 & -4 \\ 0 & 0 & 1 & 11 & -3 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 8 \\ 0 & 1 & 0 & 0 & -\frac{21}{2} \\ 0 & 0 & 1 & 0 & -\frac{17}{2} \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{array}\right]$$

$x = 8$

$y = -\frac{21}{2}$

$z = -\frac{17}{2}$

$u = \frac{1}{2}$

$4R \cdot (-11) + 3R \quad 4R \cdot (-13) + 2R$

$4R \cdot 8 + 1R$

4. $\lim\limits_{x \to 0} \left(\frac{\sqrt{6+0)^2} - \sqrt{6}}{0} \right) = \frac{\sqrt{6} - \sqrt{6}}{0} = \pm\infty$

$\lim\limits_{n \to \infty} \left(\frac{e^{\infty} + 6}{e^{\infty}} \right) = \frac{e^{\infty}+6}{e^{\infty}} = \infty$

6. $f(x) = \ln(\sin(2x^2-1))$

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

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

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

$= 4 \mathrm{ctg}\, x (2x^2-1)$

Ime i prezime: Andrija Kamber **Broj indeksa:** 17-2-0448-2014

5. $\left[\begin{array}{cccc|c} 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 0 & -3 & 4 \\ 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 0 & -3 & 4 \\ 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \sim$

$3R \leftrightarrow 1R$

$1R\cdot(-2)+2R$
$1R\cdot(-4)+3R$
$1R\cdot(-2)+4R$

$\sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 3 & -3 & -6 & -3 \end{array}\right] /:3 \sim \left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 1 & -1 & 2 & -1 \end{array}\right] \sim$

$4R \leftrightarrow 2R$

$\left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 1 & -1 & 2 & -1 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 3 & -4 & -5 & 0 \end{array}\right] \sim \left[\begin{array}{cccc|c} 1 & 0 & 1 & 3 & 1 \\ 0 & 1 & -1 & 2 & -1 \\ 0 & 0 & -4 & -8 & -6 \\ 0 & 0 & -1 & -11 & 3 \end{array}\right] \sim$

$2R\cdot 1+1R$
$2R\cdot(-3)+3R$
$2R\cdot(-3)+4R$

$4R \leftrightarrow 3R$

$\left[\begin{array}{cccc|c} 1 & 0 & 1 & 3 & 1 \\ 0 & 1 & -1 & 2 & -1 \\ 0 & 0 & -1 & -11 & 3 \\ 0 & 0 & -4 & -8 & -6 \end{array}\right] (:-1) \sim \left[\begin{array}{cccc|c} 1 & 0 & 1 & 3 & 1 \\ 0 & 1 & -1 & 2 & -1 \\ 0 & 0 & 1 & 11 & -3 \\ 0 & 0 & -4 & -8 & -6 \end{array}\right] \sim$

$3R\cdot(-1)+1R$ [illegible]

4. $4x - y + z + 2u = -1$

$4 \cdot 8 + \frac{21}{2} - \frac{17}{2} + \frac{1}{2} =$

$$\left[\begin{array}{cccc|c} 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 0 & -3 & 4 \\ 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \sim$$

$3R \longleftrightarrow 1R$

$$\left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 2 & 1 & 0 & -3 & 4 \\ 4 & -1 & 1 & 2 & -1 \\ 2 & 1 & 1 & -4 & 1 \end{array}\right] \sim$$

$1R \cdot (-2) + 2R$

$1R \cdot (-4) + 3R$

$1R \cdot (-2) + 4R$

$$\left[\begin{array}{cccc|c} 1 & -1 & 2 & 1 & 2 \\ 0 & 3 & -4 & -5 & 0 \\ 0 & 3 & -7 & -2 & -9 \\ 0 & 3 & -3 & -6 & -3 \end{array}\right] \sim$$

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POPUNJAVA NASTAVNIK

Broj ↓ bodova

IME I PREZIME: Ante Mikelić

BROJ INDEKSA: 0269078840

1. Riješi jednadžbu među kompleksnim brojevima: $z^3 - 6 - 6i = 0$. *Prikaži rješenja u kompleksnoj ravnini!* 12+3
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\end{array}$$

6. Odrediti prvu derivaciju funkcije: $f(x) = \ln(\sin(2x^2 - 1))$. 10

Ukupno: 0

F(x)