

MATEMATIKA 1: Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj

POPUNJAVA
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bodova

odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod!!

23

IME I PREZIME: **KREŠIMIR ANTOLOVIĆ**

VRIJEME POČETKA: 17:15

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): 17-2-0402-2014

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije. 20 graf
2. Odrediti tok funkcije $f(x) = \frac{x^2 - 2}{x^2 + 3}$ i skicirati graf. 20 graf
3. Navesti posebno lokalne, a posebno globalne ekstreme funkcije $f(x) = 2x^2 - 3$. Posebno komentirati (ne)ograničenost. 7+7+6
4. Gaussovom metodom riješiti matrični sustav: **12+3**

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

Provjeri uvrštavanjem!

5. Ispitati domenu funkcije $g(x) = \frac{x}{\ln x}$. 15

6. Riješiti jednadžbu u kompleksnim brojevima: $z^3 = \frac{2 + 2i}{2 - 2i}$. 15

Ukupno:
30

① $f(x) = \sqrt{x^2 + 8x + 15}$

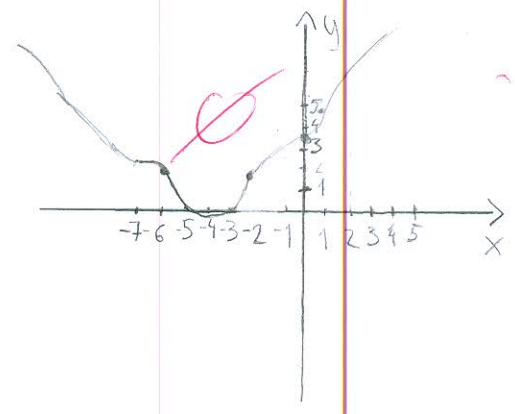
1.) $x^2 + 8x + 15 \geq 0$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-8 \pm \sqrt{64 - 60}}{2} = \frac{-8 \pm 2}{2}$$

$x_1 = -3 \quad x_2 = -5$

$D(f) = \langle -\infty, -5 \rangle \cup [-3, +\infty \rangle$

$f(x)$	x
$\sqrt{3}$	-6
0	-5
0	-3
$2\sqrt{6}$	1
$\sqrt{35}$	2
$\sqrt{3}$	-2
$2\sqrt{2}$	-7
$\sqrt{15}$	0



④ $\begin{aligned} x + 2y - z + u &= 2 \\ 2x + 5y - z + 2u &= 3 \\ 3x - y - 2z + u &= 2 \\ x - y + 3z - 5u &= 2 \end{aligned}$

$$\begin{bmatrix} 1 & 2 & -1 & 1 & 2 \\ 2 & 5 & -1 & 2 & 3 \\ 3 & -1 & -2 & 1 & 2 \\ 1 & -1 & 3 & -5 & 2 \end{bmatrix} \begin{array}{l} \\ +1R \cdot (-2) \\ +1R \cdot (-3) \\ +1R \cdot (-1) \end{array}$$

$$\approx \begin{bmatrix} 1 & 2 & -1 & 1 & 2 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & -7 & 1 & -2 & -4 \\ 0 & -3 & 4 & -6 & 0 \end{bmatrix} \begin{array}{l} /+2R \cdot (-2) \\ \\ +2R \cdot 7 \\ +2R \cdot 3 \end{array}$$

$$\approx \begin{bmatrix} 1 & 0 & -3 & 1 & 4 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & 0 & 8 & -2 & -11 \\ 0 & 0 & 7 & -6 & -3 \end{bmatrix} \begin{array}{l} \\ \\ /:8 \\ \end{array} \approx$$

$$\approx \begin{bmatrix} 1 & 0 & -3 & 1 & | & 4 \\ 0 & 1 & 1 & 0 & | & -1 \\ 0 & 0 & 1 & -\frac{1}{4} & | & -\frac{11}{8} \\ 0 & 0 & 7 & -6 & | & -3 \end{bmatrix} \begin{array}{l} +3R \cdot 3 \\ +3R \cdot (-1) \\ +3R \cdot (-7) \end{array}$$

$$\approx \begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} & | & -\frac{1}{8} \\ 0 & 1 & 0 & \frac{1}{4} & | & \frac{3}{8} \\ 0 & 0 & 1 & -\frac{1}{4} & | & -\frac{11}{8} \\ 0 & 0 & 0 & -\frac{17}{4} & | & \frac{53}{8} \end{bmatrix} \begin{array}{l} \\ \\ \\ \div (-\frac{17}{4}) \end{array}$$

$$\approx \begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} & | & -\frac{1}{8} \\ 0 & 1 & 0 & \frac{1}{4} & | & \frac{3}{8} \\ 0 & 0 & 1 & -\frac{1}{4} & | & -\frac{11}{8} \\ 0 & 0 & 0 & 1 & | & -\frac{53}{34} \end{bmatrix} \begin{array}{l} +4R \cdot (-\frac{1}{4}) \\ +4R \cdot (\frac{1}{4}) \\ +4R \cdot (\frac{1}{4}) \end{array}$$

$$\approx \begin{bmatrix} 1 & 0 & 0 & 0 & | & \frac{9}{34} \\ 0 & 1 & 0 & 0 & | & \frac{13}{17} \\ 0 & 0 & 1 & 0 & | & -\frac{30}{17} \\ 0 & 0 & 0 & 1 & | & -\frac{53}{34} \end{bmatrix}$$

$$\begin{aligned} x &= \frac{9}{34} \\ y &= \frac{13}{17} \\ z &= -\frac{30}{17} \\ u &= -\frac{53}{34} \end{aligned}$$

$$\begin{bmatrix} 1 & 2 & -1 & 1 \\ 2 & 5 & -1 & 2 \\ 3 & -1 & -2 & 1 \\ 1 & -1 & 3 & -5 \end{bmatrix} \begin{bmatrix} \frac{9}{34} \\ \frac{13}{17} \\ -\frac{30}{17} \\ -\frac{53}{34} \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \\ 2 \\ 2 \end{bmatrix}$$

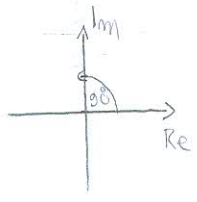
$$\begin{aligned} \frac{9}{34} + 2 \cdot \frac{13}{17} - 1 \cdot (-\frac{30}{17}) + (-\frac{53}{34}) &= 2 \\ 2 \cdot \frac{9}{34} + 5 \cdot \frac{13}{17} - 1 \cdot (-\frac{30}{17}) + 2 \cdot (-\frac{53}{34}) &= 3 \\ 3 \cdot \frac{9}{34} - 1 \cdot \frac{13}{17} - 2 \cdot (-\frac{30}{17}) + (-\frac{53}{34}) &= 2 \\ \frac{9}{34} - \frac{13}{17} + 3 \cdot (-\frac{30}{17}) - 5 \cdot (-\frac{53}{34}) &= 2 \end{aligned}$$

5) $g(x) = \frac{x}{\ln x}$ $D(g) = \langle 1, +\infty \rangle$ X

- 1) $\ln x \neq 0$
- 2) $\ln x > 0$
- $\ln x \neq 0 / e^0$
- $x \neq e^0$
- $x \neq 1$

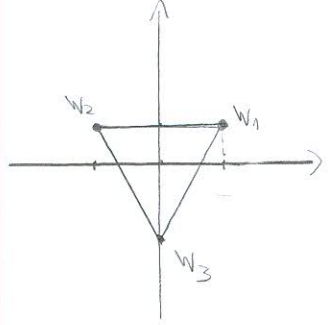
$$\frac{2+2i}{2-2i} \cdot \frac{2+2i}{2+2i} = \frac{4+8i-4}{4+4} = \frac{8i}{8} = i \checkmark$$

6) $z^3 = \frac{2+2i}{2-2i} = i \checkmark \implies z = \sqrt[3]{i}$



$$r = |w| = \sqrt{x^2 + y^2} = \sqrt{0^2 + 1^2} = \sqrt{1} = 1$$

$$\rho = 90^\circ = \frac{\pi}{2}$$



$$k=0 \quad w_1 = \sqrt[3]{1} \cdot \left(\cos \frac{\frac{\pi}{2} + 0 \cdot 2\pi}{3} + i \sin \frac{\frac{\pi}{2} + 0 \cdot 2\pi}{3} \right) = \sqrt[3]{1} \cdot \left(\cos \frac{\pi}{6} + i \sin \frac{\pi}{6} \right) = \frac{\sqrt{3}}{2} + \frac{1}{2}i$$

$$k=1 \quad w_2 = \sqrt[3]{1} \cdot \left(\cos \frac{\frac{\pi}{2} + 1 \cdot 2\pi}{3} + i \sin \frac{\frac{\pi}{2} + 1 \cdot 2\pi}{3} \right) = \sqrt[3]{1} \cdot \left(\cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6} \right) = -\frac{\sqrt{3}}{2} + \frac{1}{2}i$$

$$k=2 \quad w_3 = \sqrt[3]{1} \cdot \left(\cos \frac{\frac{\pi}{2} + 2 \cdot 2\pi}{3} + i \sin \frac{\frac{\pi}{2} + 2 \cdot 2\pi}{3} \right) = \sqrt[3]{1} \cdot \left(\cos \frac{9\pi}{6} + i \sin \frac{9\pi}{6} \right) = -i \checkmark$$

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

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IME I PREZIME: Jure Perić

VRJEME POČETKA:

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): 0269085660

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije.
2. Odrediti tok funkcije $f(x) = \frac{x^2 - 2}{x^2 + 3}$ i skicirati graf.
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4. Gaussovom metodom riješiti matricni sustav:

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

Provjeri uvrštavanjem!

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20 graf

20 graf

7+7+6

12+3

~~15~~

15

Ukupno:

40

$$l = \lim_{x \rightarrow +\infty} \left[\frac{(\sqrt{x^2 + 8x + 15}) - x}{1} \right] = \lim_{x \rightarrow +\infty} \frac{\sqrt{x^2 + 8x + 15} - x}{\sqrt{x^2 + 8x + 15} + x} = \frac{x^2 + 8x + 15 - x^2}{\sqrt{x^2 + 8x + 15} + x}$$



$$f(x) = \sqrt{x^2 + 8x + 15}$$

$$f'(x) = \frac{1}{2\sqrt{x^2 + 8x + 15}} \cdot (2x + 8)$$

K.A, D KAJI ALAK $l = 4$ $y = kx + l$

$$\lim_{x \rightarrow +\infty} \frac{8x + 15}{\sqrt{x^2 + 8x + 15} + x} \stackrel{/:x}{=} \lim_{x \rightarrow +\infty} \frac{8}{2} = 4$$

x	-3	1
y	4	5

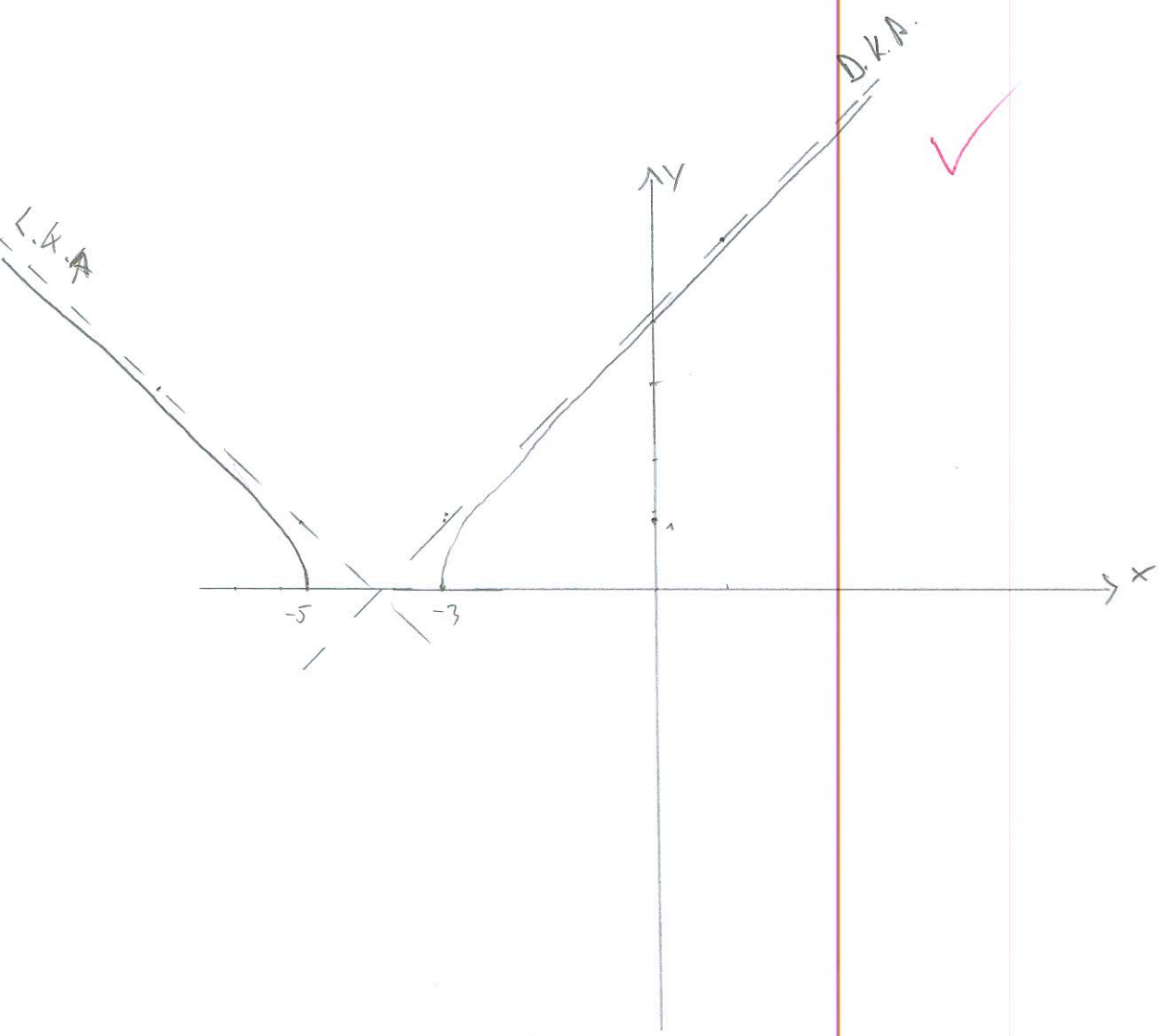
L.k.A. $k = \lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 + 8x + 15}}{x} \stackrel{/:x}{=} \lim_{x \rightarrow -\infty} \frac{1}{-1} = -1$ $k = -1$

$$l = \lim_{x \rightarrow -\infty} [(\sqrt{x^2 + 8x + 15}) - (-1 \cdot x)] = \lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 + 8x + 15} + x}{1} \cdot \frac{\sqrt{x^2 + 8x + 15} - x}{\sqrt{x^2 + 8x + 15} - x} = \frac{x^2 + 8x + 15 - x^2}{\sqrt{x^2 + 8x + 15} - x} \stackrel{/:x}{=} \frac{8x + 15}{\sqrt{x^2 + 8x + 15} - x}$$

$$\lim_{x \rightarrow -\infty} \frac{-8}{-2} = -4$$

$l = -4$

x	-5	-7
y	1	3



$$(2) f(x) = \frac{x^2 - 2}{x^2 + 3}$$

$$x^2 + 3 \neq 0$$

$$x^2 + 3 = 0$$

$$x^2 = -3$$

$$x = \pm \sqrt{-3}$$

Df: \mathbb{R}

H.A. D

$$\lim_{x \rightarrow +\infty} \frac{x^2 - 2}{x^2 + 3} \stackrel{/:x^2}{=} \lim_{x \rightarrow +\infty} \frac{1 - \frac{2}{x^2}}{1 + \frac{3}{x^2}} = \lim_{x \rightarrow +\infty} \frac{1}{1} = 1$$

DHA $y = 1$ OBROVNANKA

H.A. L

$$\lim_{x \rightarrow -\infty} \frac{x^2 - 2}{x^2 + 3} = \lim_{x \rightarrow +\infty} \frac{x^2 - 2}{x^2 + 3} = 1$$

NEHA V.

K.A.

$$K = \lim_{x \rightarrow +0} \left[\frac{x^2 - 2}{x^2 + 3} \cdot \frac{x}{1} \right] = \lim_{x \rightarrow +0} \frac{x^2 - 2}{x^3 + 3x} \stackrel{/:x^3}{=} \lim_{x \rightarrow +0} \frac{\frac{x^2 - 2}{x^3} \cdot \frac{1}{x}}{\frac{1}{x^2} + \frac{3}{x}} = \frac{0}{1}$$

NEHA K.A.

$$f(x) = 0 \quad \frac{x^2 - 2}{x^2 + 3} = 0 \quad / \cdot x^2 + 3$$

$$x^2 - 2 = 0$$

$$x^2 = 2$$

$$x_1 = \sqrt{2} \quad x_2 = -\sqrt{2}$$

$$f(0) = \frac{0^2 - 2}{0^2 + 3} = -\frac{2}{3}$$

TOČKA SJEČIŠTA $(-\frac{2}{3}, 0)$

NULLTOČNE

$$M_1 (-\sqrt{2}, 0)$$

$$M_2 (\sqrt{2}, 0)$$



$$5. \quad g(x) = \frac{x}{\ln x}$$

$$\ln x \neq 0$$

$$\ln x = 0$$

$$e^0 = 1$$

$$D(f) = \mathbb{R} \setminus \{1\} \quad \times$$

$$D(f) = \langle 0, 1 \rangle \cup \langle 1, +\infty \rangle \quad \checkmark$$

$$2. \quad f(x) = \frac{x^2 - 2}{x^2 + 3}$$

$$D(f) = \mathbb{R} \setminus \{-3, 3\}$$

$$x^2 + 3 \neq 0$$

$$x^2 + 3 = 0$$

$$x^2 = -3$$

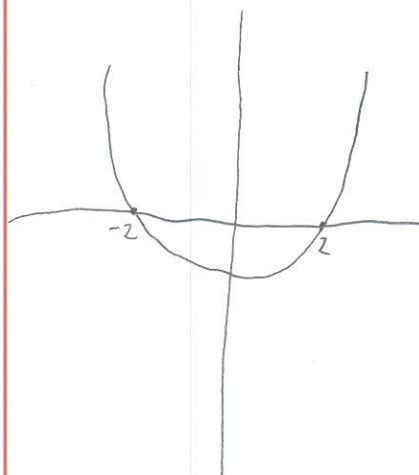
$$x = \pm 3$$

PARNOST

$$f(-1) = \frac{1 - 2}{1 + 3} = -\frac{1}{4}$$

PARVA JE

$$f(1) = \frac{1 - 2}{1 + 3} = -\frac{1}{4}$$



GRAT

NUL TOČKE

$$x^2 - 2 = 0$$

$$x^2 = 2$$

$$x_1 = -2$$

$$x_2 = 2$$

KARLO KOLJAJA

$$1. f(x) = \sqrt{x^2 + 8x + 15}$$

$$x^2 + 8x + 15 \geq 0$$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-8 \pm \sqrt{64 - 4 \cdot 1 \cdot 15}}{2} = \frac{-8 \pm 2}{2}$$

$$x_1 = -4 - 1 = -5$$

$$x_2 = -4 + 1 = -3$$

$$f(-1) = \sqrt{1 + -8 + 15} = 2\sqrt{2}$$

$$f(1) = \sqrt{26} = 2\sqrt{6}$$

GRAF

$$f(x) = 2^{x^2 - 3} = \frac{1}{4}$$

$$f'(x) = \frac{1' \cdot 4 + 1 \cdot 4'}{4^2} = \frac{1}{2} \quad \text{EKSTREM}$$

$$f''(x) = \frac{1' \cdot 2 + 1 \cdot 2'}{2^2} = 1 \quad \text{MAKSIMUM}$$



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IME I PREZIME: MATEJ SORIC

VRIJEME POČETKA:

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): 0171253871

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

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Ukupno:

15

5. $g(x) = \frac{x}{\ln x}$

$\ln x \neq 0 \quad \ln x > 0$

$D(g) = x \in \langle 0, +\infty \rangle$ ~~X~~

1. $f(x) = \sqrt{x^2 + 8x + 15}$

$x^2 + 8x + 15 \geq 0$

$x^2 + 8x + 15 = 0$

$x_{1,2} = \frac{-8 \pm \sqrt{64 - 60}}{2}$

$x_1 = -3, \quad x_2 = -5$

$\sqrt{x^2 + 8x + 15}$ $\begin{matrix} -\infty & -5 & -3 & +\infty \\ | \oplus & \ominus & \oplus & | \end{matrix}$

$Df: x \in \langle -\infty, -5 \rangle \cup \langle -3, +\infty \rangle$

$$f(x) = 0$$

$$\sqrt{x^2 + 8x + 15} = 0 \quad |^2 \quad x_1 = -3$$

$$x^2 + 8x + 15 = 0 \quad x_2 = -5$$

$$f(0) = \sqrt{0^2 + 8 \cdot 0 + 15}$$

$$= \sqrt{15} \quad (0, \overset{3.87}{\sqrt{15}})$$

$$f'(x) = (\sqrt{x^2 + 8x + 15})'$$

$$= \frac{1}{2} \cdot (x^2 + 8x + 15)^{-\frac{1}{2}}$$

$$= \frac{1}{2\sqrt{x^2 + 8x + 15}}$$

~~0~~
GRAF?

$$\textcircled{2} \frac{x^2-2}{x^2+3}$$

MATEJ SOLIC

$$x^2+3 \neq 0$$

$$D(f) = x \in \mathbb{R}$$

$$x^2 \neq -3$$

$$x_1 = \sqrt{3} \quad x_2 = -\sqrt{3}$$

$$f(x) = 0$$

$$\frac{x^2-2}{x^2+3} = 0 \quad | \cdot (x^2+3) \quad (\sqrt{2}, 0)$$

$$x^2-2=0$$

$$x^2=2$$

$$x = \sqrt{2} \quad x = -\sqrt{2}$$

$$(-\sqrt{2}, 0)$$

$$f(0)$$

$$\frac{0^2-2}{0^2+3} = -\frac{2}{3}$$

$$(0, -\frac{2}{3})$$

$$f(x) = \frac{x^2-2}{x^2+3}$$

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

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

$$= \frac{10x}{(x^2+3)^2}$$

$$10x = 0$$

$$x = 0$$

$$\frac{(x^2+3)^2}{x^2+3} = 0$$

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

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

$$= \frac{(x^2+3)^2 - 40x(x^2+3)}{(x^2+3)^4}$$

$$= \frac{(x^2+3)[(x^2+3) - 40x]}{(x^2+3)^4} = \frac{x^2+3-40x}{(x^2+3)^3}$$

V.A.

$$\lim_{x \rightarrow \sqrt{3}} \frac{x^2-2}{x^2+3} = \frac{3-2}{3+3} = \frac{1}{6}$$

$$\lim_{x \rightarrow \sqrt{3}^+} \frac{x^2-2}{x^2+3} = \frac{3-2}{-3+3} = \frac{5}{0} = -\infty$$

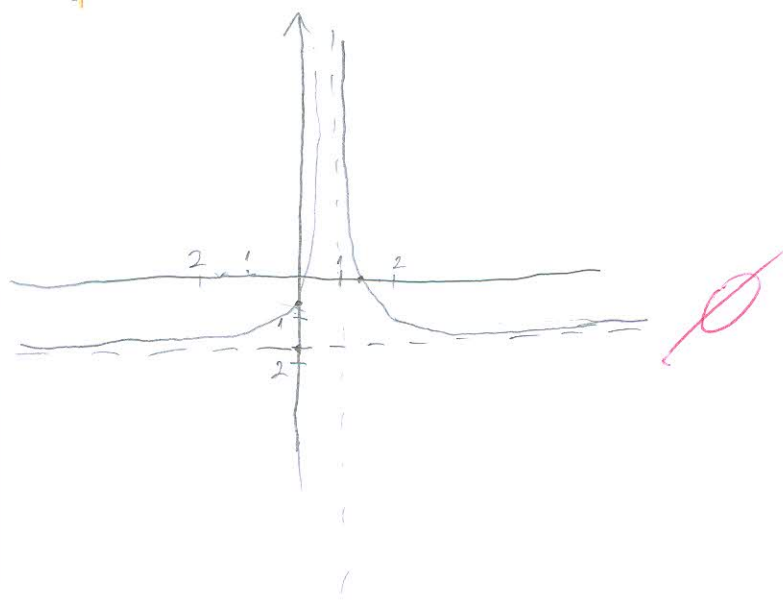
$$\lim_{x \rightarrow \sqrt{3}^-} \frac{x^2-2}{x^2+3} = \frac{\sqrt{3}-2}{\sqrt{3}^2+3} = \frac{5}{0^+} = +\infty$$

$-\sqrt{3} \notin V.A.$

H.A.

$$\lim_{x \rightarrow \infty} \frac{x^2-2/x^2}{x^2+3/x^2} = \frac{1-\frac{2}{x^2}}{1+\frac{3}{x^2}} = 1 \quad \text{D.H.A.}$$

$$\lim_{x \rightarrow -\infty} \frac{-x^2-2}{x^2+3} = \frac{1}{1} = 1^-$$



$$\textcircled{4.} \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 2 & 5 & -1 & 2 & 3 \\ 3 & -1 & -2 & 1 & 2 \\ 4 & -1 & 3 & -5 & 2 \end{array} \right] \xrightarrow{\substack{(2) \cdot (-2) \\ (3) \cdot (-3) \\ (4) \cdot (-4)}}} \sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & -7 & 1 & -2 & -4 \\ 0 & -3 & 4 & -6 & 0 \end{array} \right] \xrightarrow{\substack{(2) \cdot (-2) \\ (3) \cdot (-3)}}}$$

$$\sim \left[\begin{array}{cccc|c} 1 & 0 & -3 & 1 & 4 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & 0 & 8 & -2 & -11 \\ 0 & 0 & 7 & -6 & -3 \end{array} \right] \xrightarrow{(-1)} \sim \left[\begin{array}{cccc|c} 1 & 0 & -3 & 1 & 4 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & 0 & 1 & 4 & -8 \\ 0 & 0 & 7 & -6 & -3 \end{array} \right] \xrightarrow{\substack{(1) \cdot (-1) \\ (3) \cdot (-3)}}} \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & 13 & -20 \\ 0 & 1 & 0 & -4 & 7 \\ 0 & 0 & 1 & 4 & -8 \\ 0 & 0 & 0 & -34 & 53 \end{array} \right] \xrightarrow{(-34)}$$

$$\sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & 13 & -20 \\ 0 & 1 & 0 & -4 & 7 \\ 0 & 0 & 1 & 4 & -8 \\ 0 & 0 & 0 & 1 & -\frac{53}{34} \end{array} \right] \xrightarrow{\substack{(1) \cdot (-13) \\ (2) \cdot (-4) \\ (3) \cdot (-4)}}} \sim \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & \frac{19}{34} \\ 0 & 1 & 0 & 0 & \frac{13}{17} \\ 0 & 0 & 1 & 0 & -\frac{30}{17} \\ 0 & 0 & 0 & 1 & -\frac{53}{34} \end{array} \right]$$

$$\begin{aligned}
 x &= \frac{19}{34} \\
 y &= \frac{13}{17} \\
 z &= -\frac{30}{17} \\
 u &= -\frac{53}{34}
 \end{aligned}$$

$$\begin{aligned}
 x + 2y - z + u &= 2 \\
 \frac{19}{34} + \left(2 \cdot \frac{13}{17}\right) + \frac{30}{17} - \frac{53}{34} &= 2
 \end{aligned}$$

$$\begin{aligned}
 &265 \\
 &-197 \\
 \hline
 &68
 \end{aligned}$$

$$\frac{\frac{19}{34} - \frac{13}{17} + 3 \cdot \frac{-30}{17} - 5 \cdot \frac{-53}{34}}{34} = \frac{9 \cdot 26 - 180 + 265}{34} = \frac{68}{34} = 2$$

odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod!!

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IME I PREZIME: **MARKO MILOŠ**

VRIJEME POČETKA:

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): **17-1-0170-2013**

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije. 20 graf
2. Odrediti tok funkcije $f(x) = \frac{x^2 - 2}{x^2 + 3}$ i skicirati graf. 20 graf
3. Navesti posebno lokalne, a posebno globalne ekstreme funkcije $f(x) = 2x^2 - 3$. Posebno komentirati (ne)ograničenost. 7+7+6
4. Gaussovom metodom riješiti matrični sustav: ~~12+3~~

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

Provjeri uvrštavanjem!

5. Ispitati domenu funkcije $g(x) = \frac{x}{\ln x}$. 15
6. Riješiti jednadžbu u kompleksnim brojevima: $z^3 = \frac{2 + 2i}{2 - 2i}$. 15

Ukupno:

~~45~~

④

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

$$\left| \begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 2 & 5 & -1 & 2 & 3 \\ 3 & -1 & -2 & 1 & 2 \\ 1 & -1 & 3 & -5 & 2 \end{array} \right| \begin{array}{l} / \cdot (-2) \\ \leftarrow \\ / \cdot (-3) \\ \leftarrow \\ / \cdot (-1) \\ \leftarrow \end{array}$$

$$\sim \left| \begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 0 & 1 & 1 & 0 & 1 \\ 0 & -7 & 1 & -2 & -4 \\ 0 & -3 & 4 & -6 & 0 \end{array} \right| \begin{array}{l} \leftarrow \\ / \cdot (-2) \\ / \cdot (7) \\ / \cdot (3) \\ \leftarrow \end{array}$$

$$\sim \left| \begin{array}{cccc|c} 1 & 0 & -3 & -1 & 10 \\ 0 & 1 & 1 & 0 & 11 \\ 0 & 0 & 8 & -2 & 13 \\ 0 & 0 & 7 & -6 & 13 \end{array} \right| \begin{array}{l} ? \\ / : 8 \end{array}$$

$$\sim \left| \begin{array}{cccc|c} 1 & 0 & -3 & -1 & 10 \\ 0 & 1 & 1 & 0 & 11 \\ 0 & 0 & 1 & -\frac{1}{4} & \frac{13}{8} \\ 0 & 0 & 7 & -6 & 13 \end{array} \right| \begin{array}{l} \leftarrow \\ / : 3 \\ / \cdot (-1) \\ / \cdot (-7) \\ \leftarrow \end{array}$$

$$\sim \left| \begin{array}{cccc|c} 1 & 0 & 0 & -\frac{7}{4} & \frac{17}{4} \\ 0 & 1 & 0 & \frac{1}{4} & \frac{11}{4} \\ 0 & 0 & 1 & -\frac{1}{4} & \frac{13}{4} \\ 0 & 0 & 0 & -\frac{5}{4} & \frac{17}{4} \end{array} \right| \begin{array}{l} / : \frac{17}{4} \\ / : \frac{11}{4} \\ / : \frac{13}{4} \\ / : \frac{17}{4} \end{array}$$



$$\begin{array}{c} 2 \\ \left| \begin{array}{cccc|c} 1 & 0 & 0 & -\frac{7}{4} & 1 \\ 0 & 1 & 0 & \frac{1}{4} & 1 \\ 0 & 0 & 1 & -\frac{1}{4} & 1 \\ 0 & 0 & 0 & 1 & -\frac{3}{34} \end{array} \right. \end{array}$$

\leftarrow
 \leftarrow
 \leftarrow
 \leftarrow

$$\begin{array}{c} 2 \\ \left| \begin{array}{cccc|c} 1 & 0 & 0 & 0 & \frac{33}{34} \\ 0 & 1 & 0 & 0 & \frac{11}{17} \\ 0 & 0 & 1 & 0 & \frac{6}{17} \\ 0 & 0 & 0 & 1 & -\frac{3}{34} \end{array} \right. \end{array}$$

PROWERA

$$\frac{33}{34} + 2 \cdot \frac{11}{17} - \frac{6}{17} + \frac{3}{34} = 2$$

$$2 \cdot \frac{33}{34} + 5 \cdot \frac{11}{17} - \frac{6}{17} + \frac{3}{34} = 3$$

$$3 \cdot \frac{33}{34} - \frac{11}{17} - 2 \cdot \frac{6}{17} + \frac{3}{34} = 2$$

$$\frac{33}{34} - \frac{11}{17} + 3 \cdot \frac{6}{17} - 5 \cdot \frac{3}{34} = 2$$

$$\frac{33 + 44 - 12 + 3}{34} = \frac{68}{34} = 2 \checkmark$$

$$\frac{33 - 22 + 36 - 15}{34} = \frac{32}{34} \neq 2$$



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

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POPUNJAVA
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bodova

IME I PREZIME: *MATE VITLOV*

VRIJEME POČETKA:

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): *77-1-029-0001*

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije. 20 graf
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4. Gaussovom metodom riješiti matični sustav: 12+3

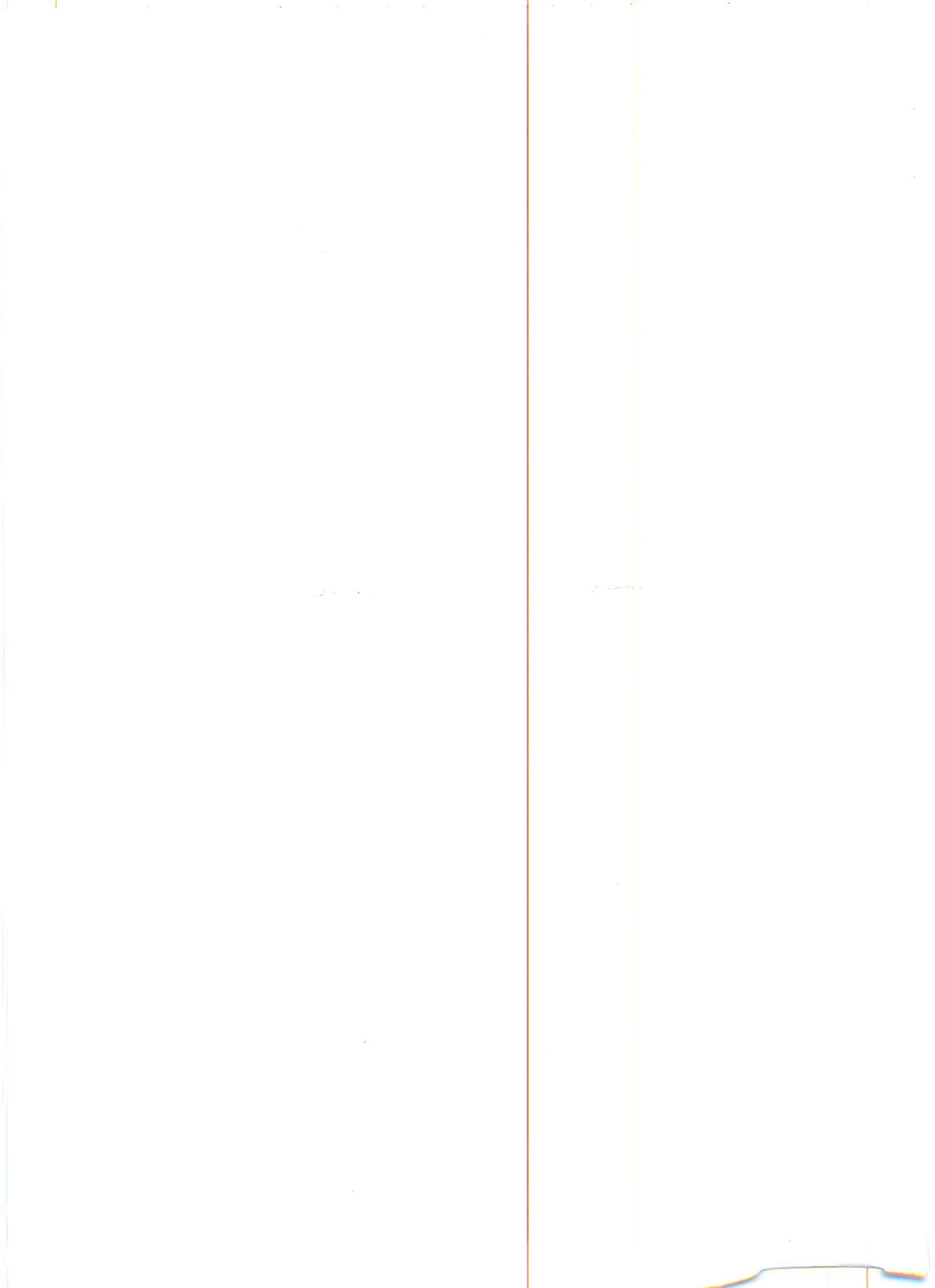
$$\begin{aligned}x + 2y - z + u &= 2 \\2x + 5y - z + 2u &= 3 \\3x - y - 2z + u &= 2 \\x - y + 3z - 5u &= 2\end{aligned}$$

Provjeri uvrštavanjem!

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Ukupno:

15



$$1) \quad \frac{y^2 - 2}{x^2 + 3}$$

$$2) \quad f(x) = \frac{y^2 - 2}{x^2 + 3}$$

$$g(x) = \frac{-2x^2}{3x^2}$$

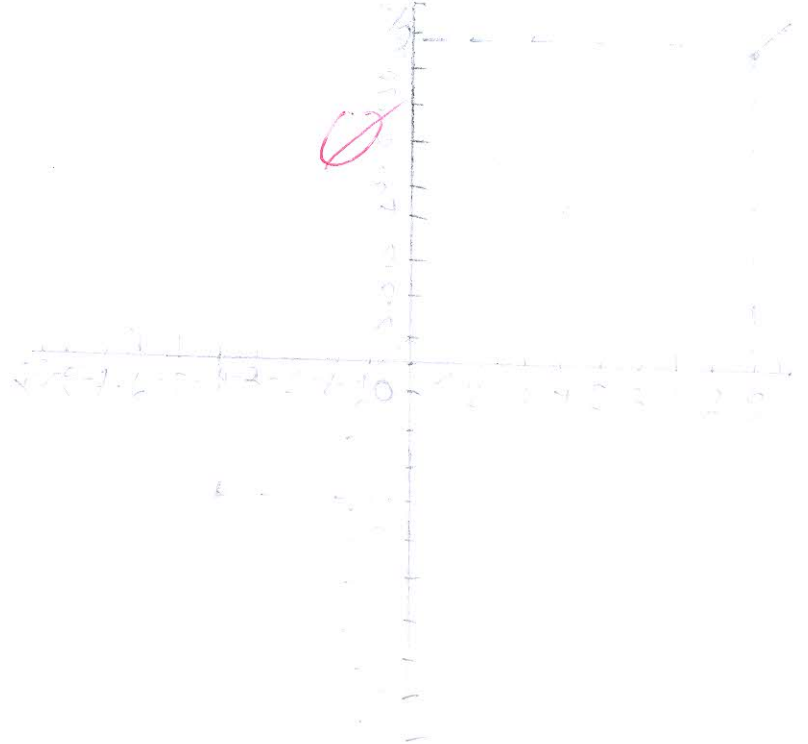
$$f(x) = \frac{\quad}{3}$$

$$4) \quad x - 2y - 2xy = 0$$

$$2x - 2y - 2 = 0$$

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

$$x - 72 = 0$$



$$1) f(x) = \sqrt{x^2 + 8x + 15}$$

$$f(x) = \sqrt{8x + 15}$$

$$f(x) = \sqrt{39}$$

$$f(x) = 3.9$$

3.9

3.9

3.9

3.9

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

IME I PREZIME: *Luka Grubić* VRIJEME POČETKA: _____

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): *17-2-0371-2019, 0263086641*

Želim ustmeni kod (zaokružiti): prof. Uglešića asistenta Kosora

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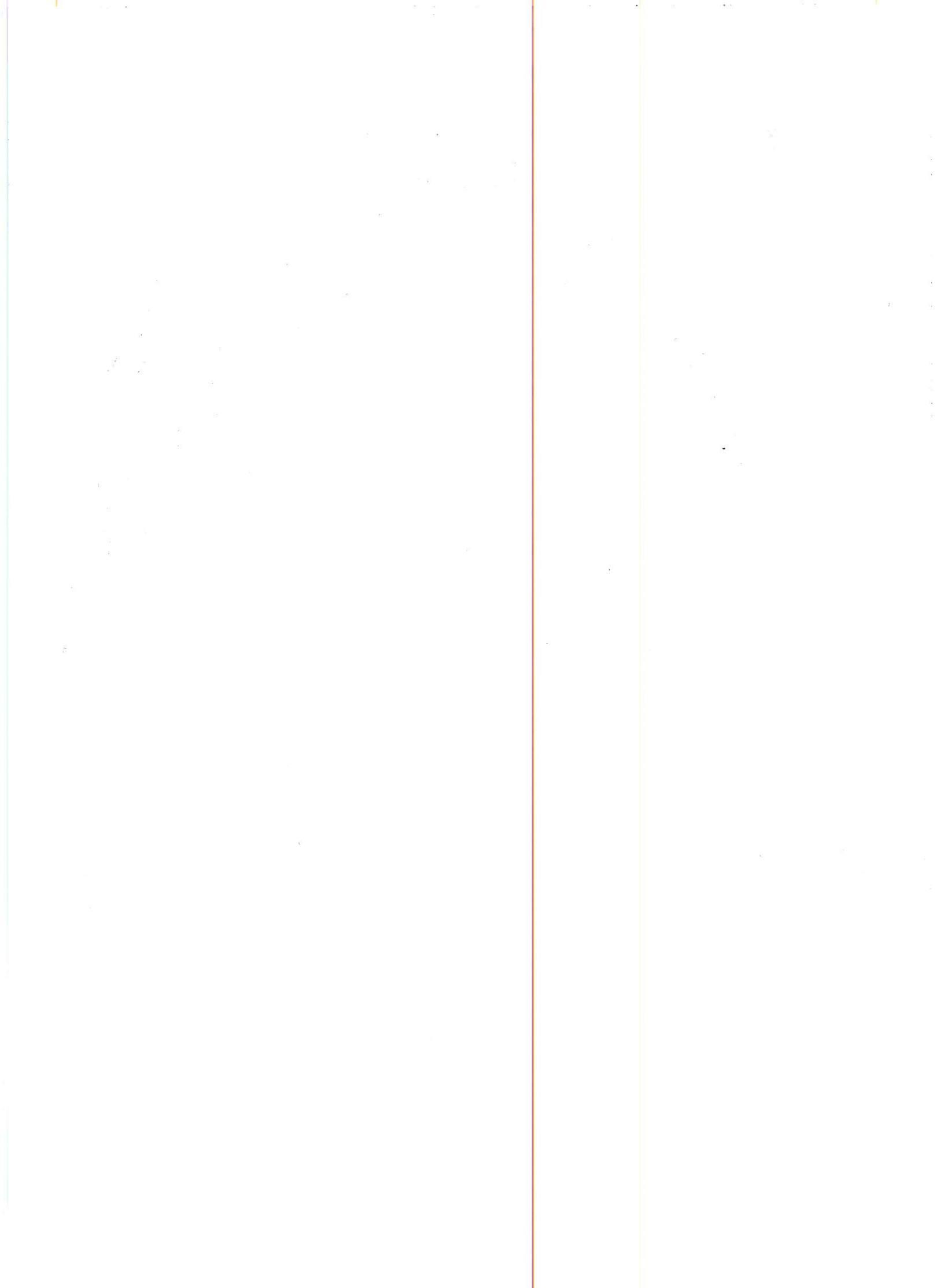
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Ukupno: _____



ZAKA GRUBSIC

2) f(x) = (x^2 - 2) / (x^2 + 3)

Domena x^2 + 3 ≠ 0

a=1 b=0 c=3 x_{1,2} = (±√-1) / 2

D(f) = R

f(x) = 0 → x^2 - 2 = 0

a=1 b=0 c=-2

x_{1,2} = ± 2.82 / 2

NT_1 (1.41, 0)

NT_2 (-1.41, 0)

x_1 = 1.41

x_2 = -1.41

f(0) = -2/3 = -0.66 S(0, -0.66)

Nema vertikalne asimptote

H.A. lim_{x→±∞} (x^2-2)/(x^2+3) = 1 OHA... y=1

Nema kose asimptote

f'(x) = (2x(x^2+3) - (x^2-2)·2x) / (x^2+3)^2 = 10x / (x^2+3)^2

f''(x) = (10·(x^2+3)^2 - 10x·2(x^2+3)·2x) / (x^2+3)^4 = (-30x^2 + 30) / (x^2+3)^3

= (10x^2 + 30 - 40x^2) / (x^2+3)^3 = (-30x^2 + 30) / (x^2+3)^3

f'(x) = 0 → 10x = 0 / 10

x = 0 → Stacionarna točka

f''(x) = 0 → -30x^2 + 30 = 0

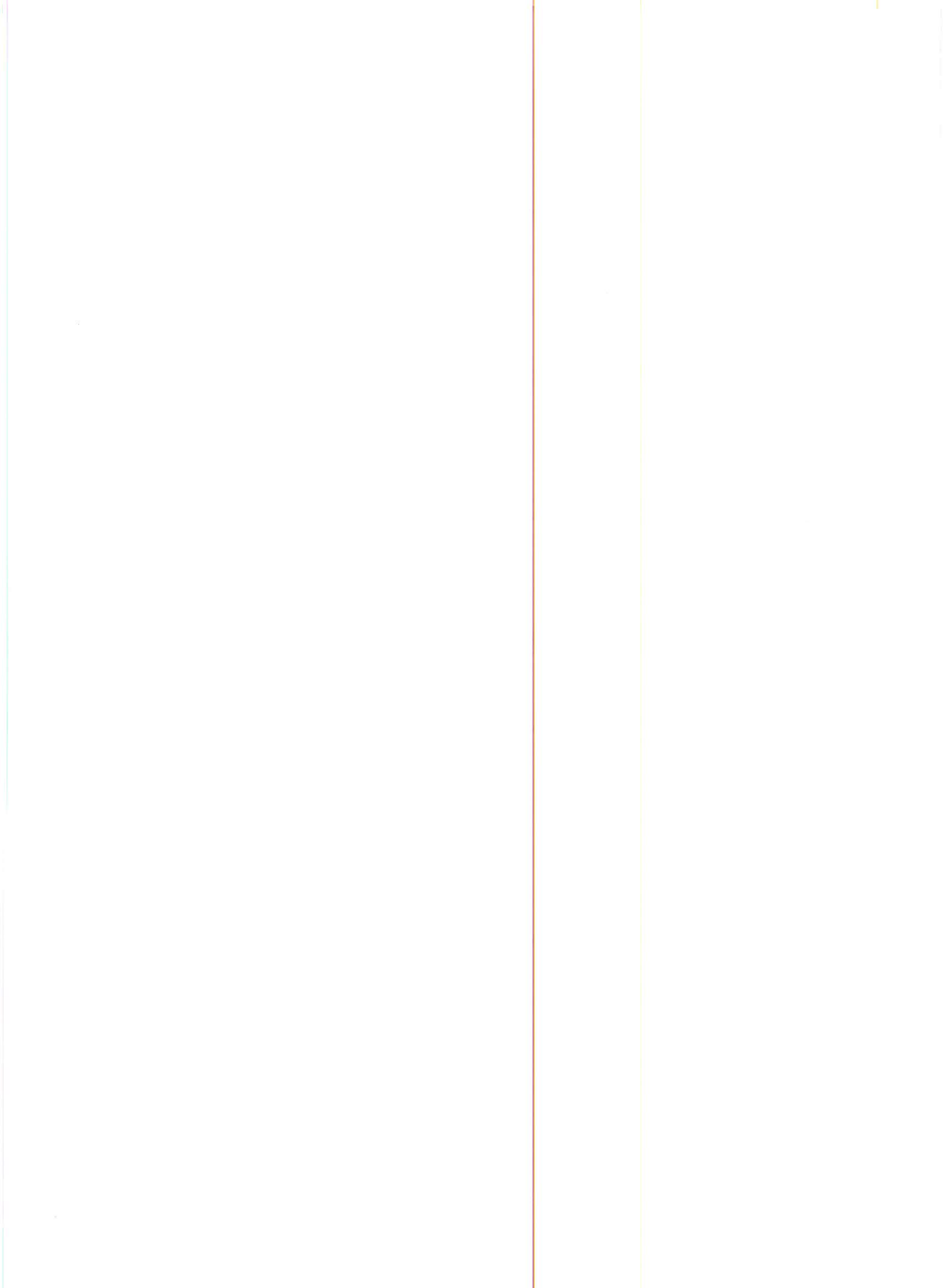
a = -30 b = 0 c = 30

x_{1,2} = ± 60 / -60





x_1 = -1

x_2 = 1

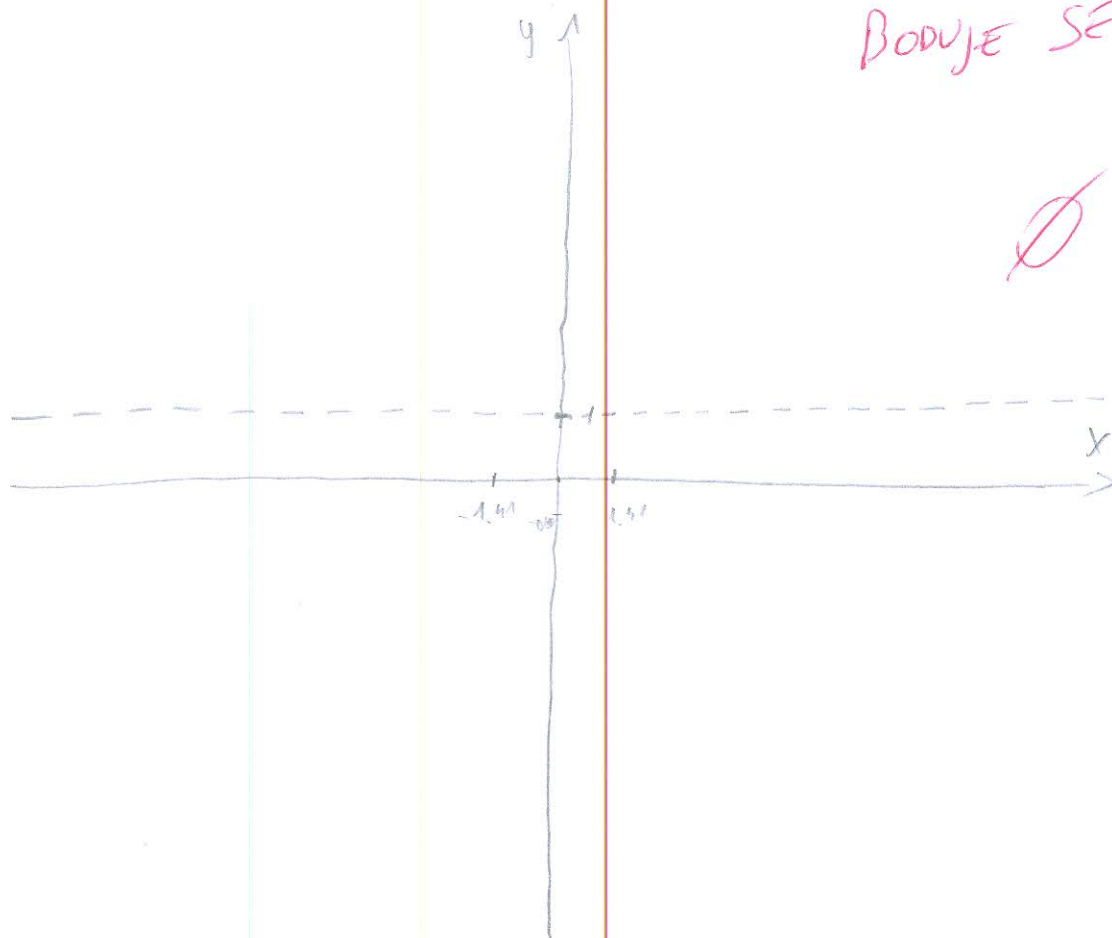
→ točke infleksije.



Luka Grubić

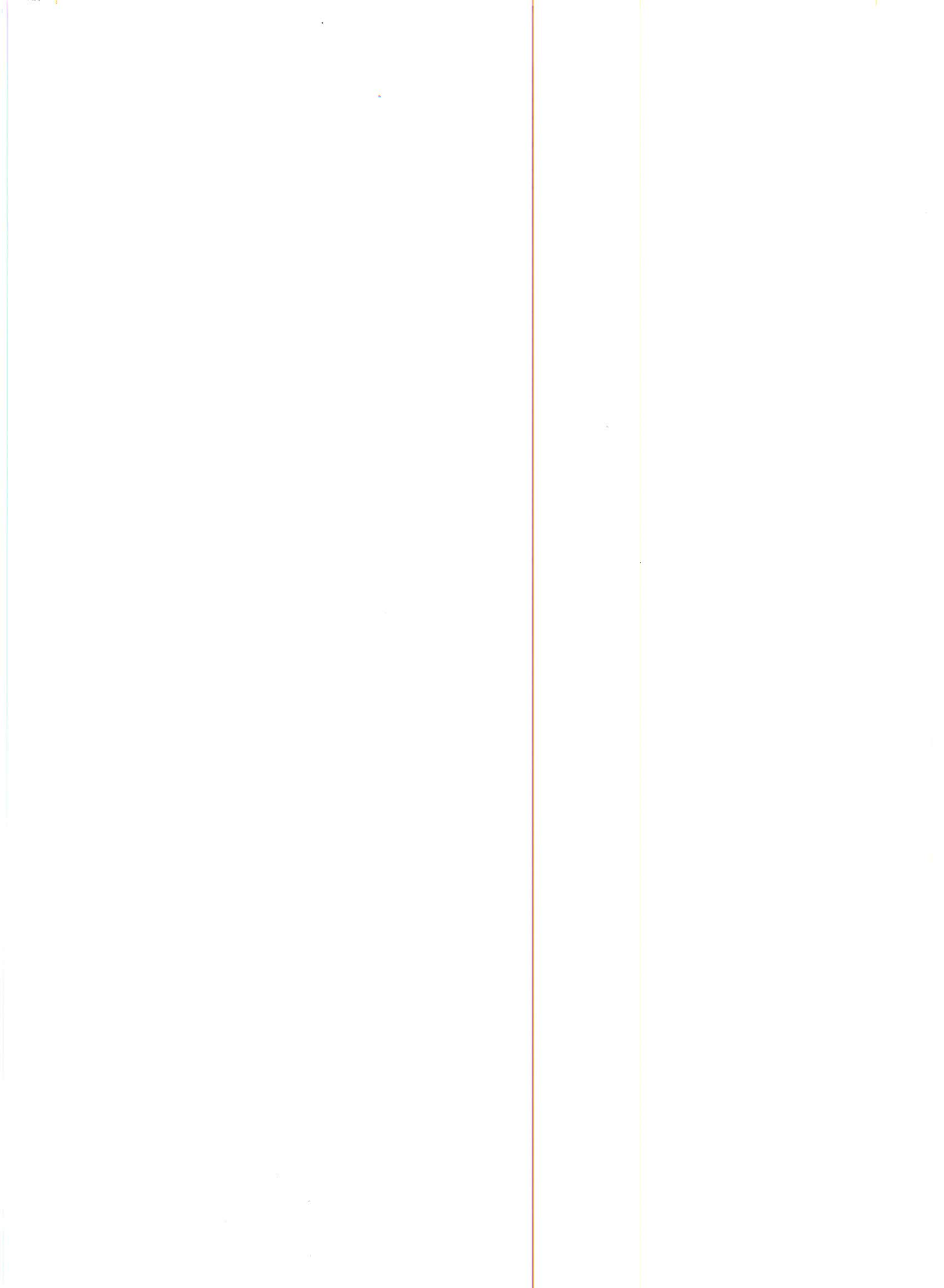
	$-\infty$	-1	0	1	$+\infty$
$f'(x)$	+	-	+	+	
$f''(x)$	-	+	+	-	
$f(x)$					

Točka minimuma



BODUJE SE SAMO GRAF!





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

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POPUNJAVA
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IME I PREZIME: *LUKA ŽILIC*

VRIJEME POČETKA:

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): *17-2-0208-2012*

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije. 20 graf
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4. Gaussovom metodom riješiti matricni sustav: 12+3

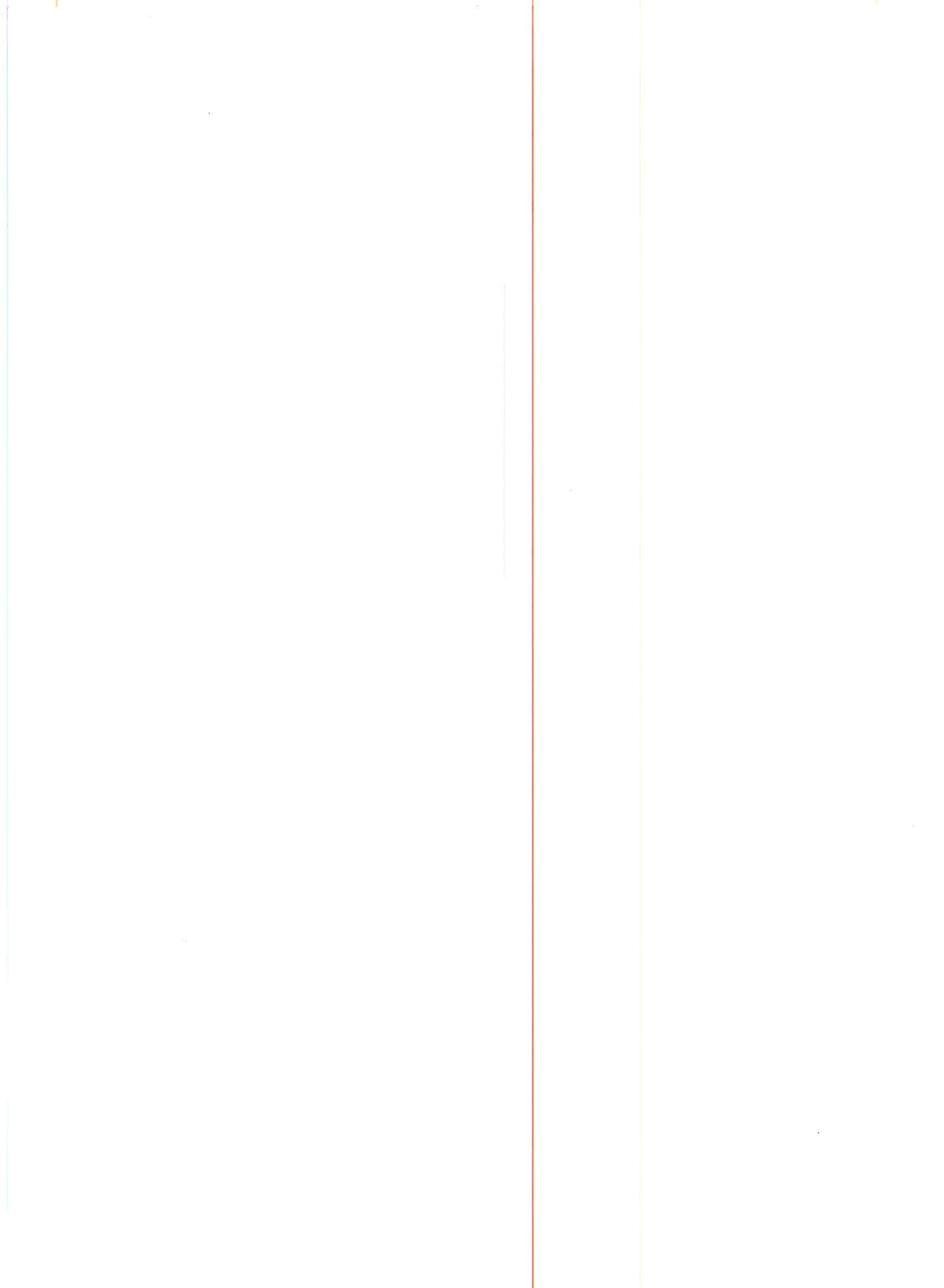
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Ukupno:



4.

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

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

$$\sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & 0 & 1 & 4 & -8 \\ 0 & 0 & 0 & -34 & 53 \end{array} \right]$$



5. DOMENA FUNKCIE

$$g(x) = \frac{x}{\ln x}$$

$$x \in [0, 1] \cup [1, +\infty) ?$$

$$D(g) = (0, 1) \cup (1, +\infty)$$

6.

$$z_3 = \frac{2+2i}{2-2i}$$



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

POPUNJAVA
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IME I PREZIME: *Nok Stolar*

VRIJEME POČETKA: *17:12*

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): *172-0367-2019*

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije. 20 graf
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Ukupno:

18

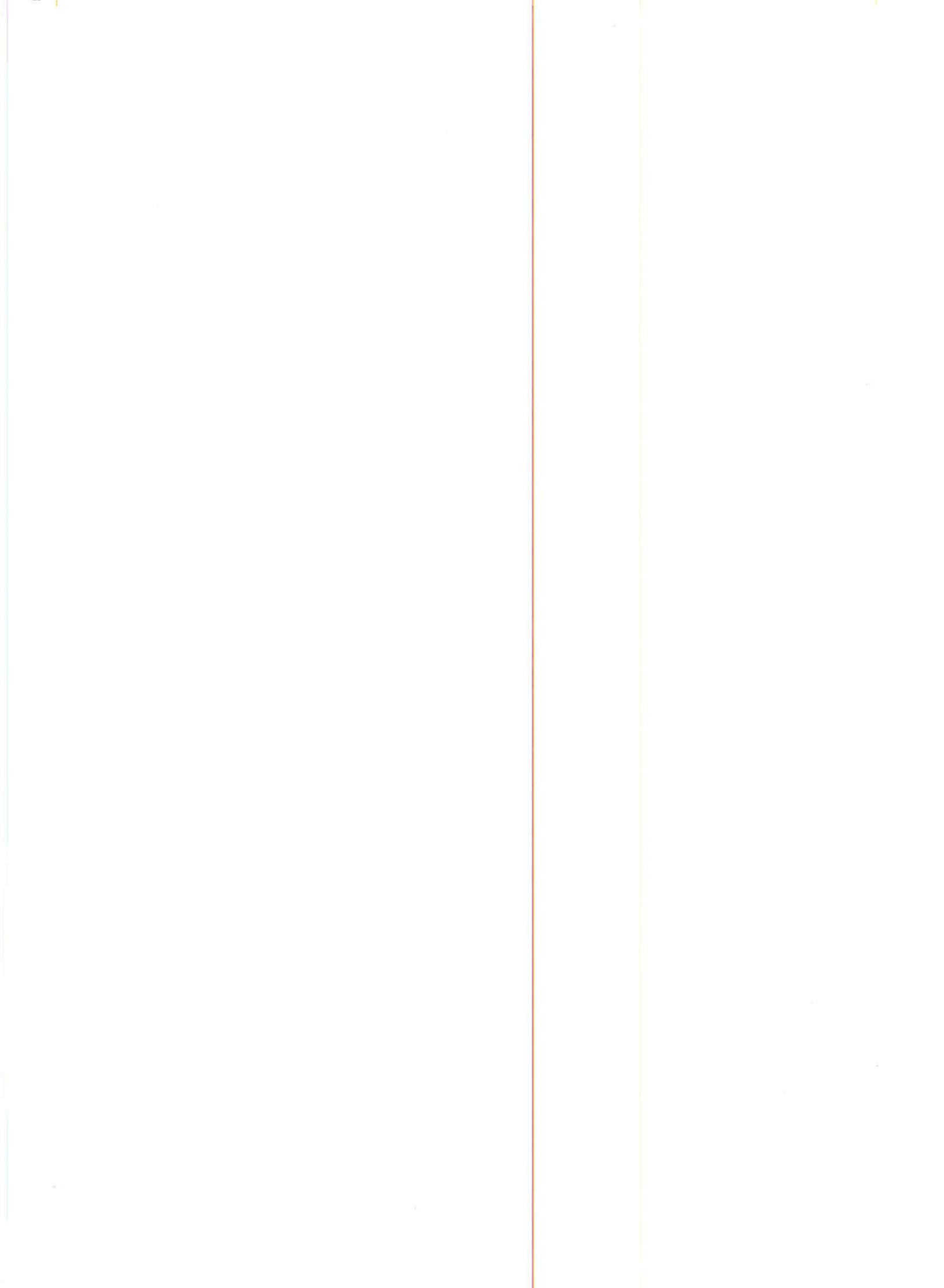
9)

$$\begin{bmatrix} 1 & 1 & 1 & 2 \\ 2 & 5 & -1 & 3 \\ 3 & -1 & -2 & 2 \\ -1 & 3 & -5 & 2 \end{bmatrix} \xrightarrow{-2}$$

$$\begin{bmatrix} 1 & 2 & -1 & 1 & 2 \\ 0 & 3 & -3 & 0 & 5 \\ 3 & -1 & -2 & 1 & 2 \\ 1 & -1 & 3 & 5 & 2 \end{bmatrix} \xrightarrow{\begin{matrix} +1 \\ +2 \\ -1 \end{matrix}}$$

$$\begin{bmatrix} 1 & 3 & -0 & 2 & 3 \\ 0 & 3 & -3 & 0 & 5 \\ 5 & 1 & 0 & 3 & 5 \\ 0 & -2 & -4 & -6 & 2 \end{bmatrix} \xrightarrow{\begin{matrix} -I \\ -2 \\ - \\ - \end{matrix}}$$

$$\begin{bmatrix} 1 & 3 & -6 & 2 & 3 \\ 0 & 1 & -5 & 0 & 3 \\ 5 & 1 & 0 & 3 & 5 \\ 0 & -2 & -4 & -6 & 2 \end{bmatrix} \xrightarrow{\begin{matrix} -5I \\ - \\ - \\ - \end{matrix}}$$



12te Skriptur

$$\textcircled{1} f(x) = \sqrt{x^2 + 8x + 15}$$

$$x^2 + 8x + 15 = 0$$

$$x = \frac{-8 \pm \sqrt{8^2 - 4 \cdot 1 \cdot 15}}{2}$$

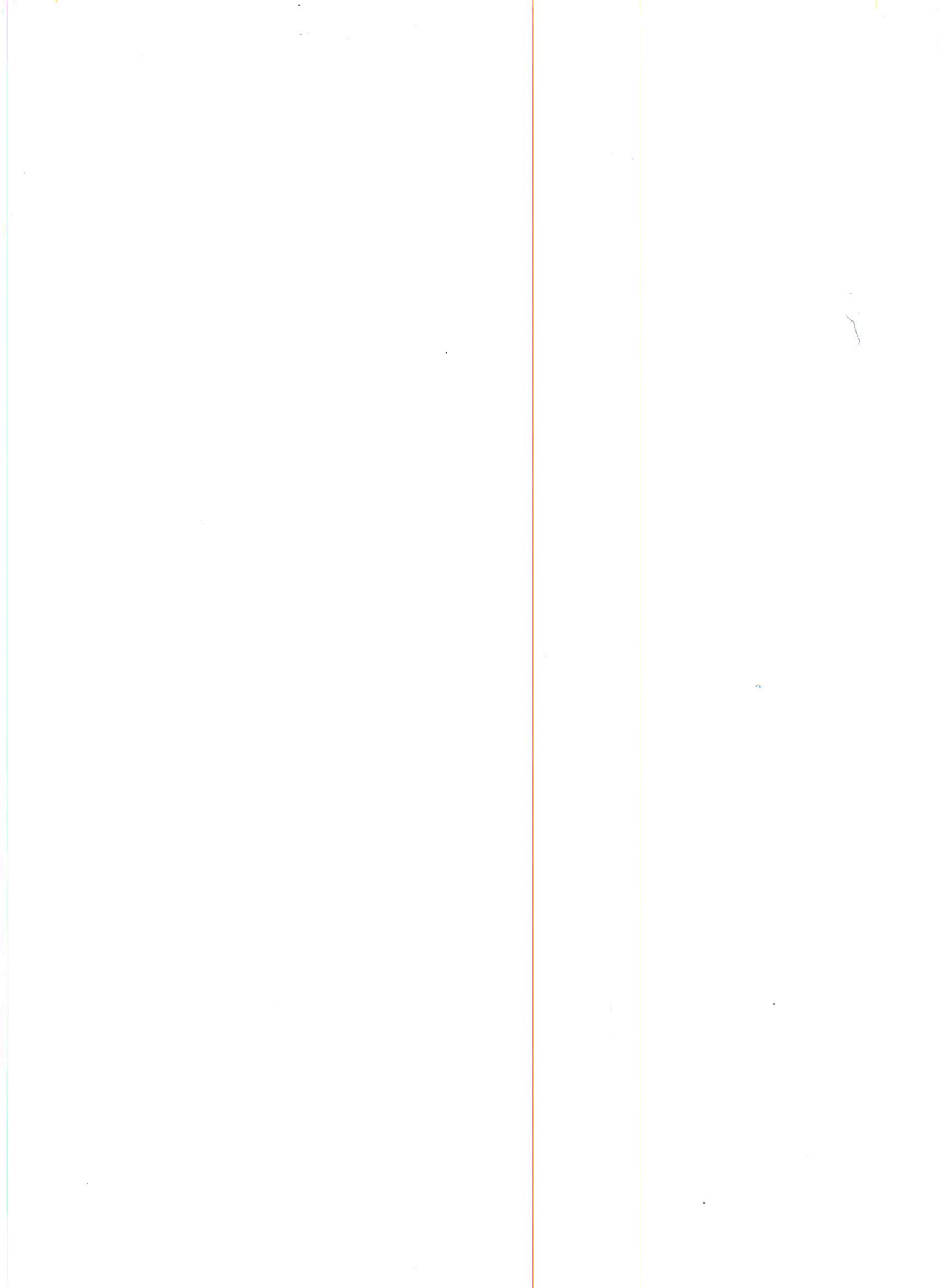
$$x = \frac{-8 \pm \sqrt{64 - 60}}{2}$$

$$x = \frac{-8 \pm 2}{2} \rightarrow \begin{cases} x_1 = 5 \\ x_2 = -3 \end{cases}$$

$$f(x)' = x^2 + 8x + 15$$

$$f(x)' = x + 8$$





odgovornosti studenata. **PIŠITE DVOSTRANO!** Obavezno popuniti sva polja ispod!!

23

IME I PREZIME: Luka Grbin

VRIJEME POČETKA:

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU): 17-K 0279-2014

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije. ~~20~~ graf
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$$\begin{aligned} x + 2y - z + u &= 2 \\ 2x + 5y - z + 2u &= 3 \\ 3x - y - 2z + u &= 2 \\ x - y + 3z - 5u &= 2 \end{aligned}$$

Provjeri uvrštavanjem!

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Ukupno:

~~0~~

1. $f(x) = \sqrt{x^2 + 8x + 15}$

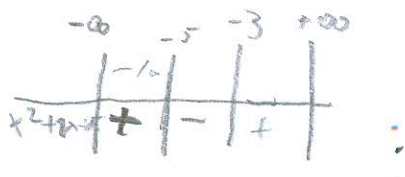
$x^2 + 8x + 15 \geq 0$

$x^2 + 8x + 15 = 0$

$x_{1,2} = \frac{-8 \pm \sqrt{8^2 - 4 \cdot 1 \cdot 15}}{2}$

$x_{1,2} = \frac{-8 \pm 2}{2}$

$x_1 = -3 \quad x_2 = -5$



$D(f(x)) = (-\infty, -5] \cup [-3, +\infty)$

N.T. $(-3, 0)$ $(-5, 0)$

$k = \lim_{x \rightarrow \infty} \frac{f(x)}{x}$

$k = \lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 8x + 15}}{x} \cdot 1/x$

$k = \lim_{x \rightarrow \infty} \frac{\sqrt{\frac{x^2}{x^2} + \frac{8x}{x^2} + \frac{15}{x^2}}}{\frac{x}{x}} \cdot \frac{1}{x}$

$k = \lim_{x \rightarrow \infty} \frac{\sqrt{1}}{1} = 1$

$|a| = 1$

$R_1 = (f(x) - kx)$

$R_1 = (\sqrt{x^2 + 8x + 15} - x) \cdot \frac{\sqrt{x^2 + 8x + 15} + x}{\sqrt{x^2 + 8x + 15} + x}$

$R_1 = \frac{(\sqrt{x^2 + 8x + 15})^2 - x^2}{\sqrt{x^2 + 8x + 15} + x} = \frac{x^2 + 8x + 15 - x^2}{\sqrt{x^2 + 8x + 15} + x}$

$R_1 = \frac{8x + 15}{\sqrt{x^2 + 8x + 15} + x} \cdot 1/x = \frac{\frac{8x}{x} + \frac{15}{x}}{\sqrt{\frac{x^2}{x^2} + \frac{8x}{x^2} + \frac{15}{x^2}} + \frac{x}{x}}$

$R_1 = \frac{8}{\sqrt{1+1}} = 4 \quad R_1 = 4$

$$k_2 = \lim_{x \rightarrow \infty} \frac{f(x)}{x^2} = A_1$$

$$k_2 = \lim_{x \rightarrow -\infty} \frac{\sqrt{(x)^2 + 8(x) + 15}}{-x}$$

$$k_2 = \lim_{x \rightarrow \infty} \frac{\sqrt{x^2 - 8x + 15}}{-x} \cdot \frac{1/x}{1/x}$$

$$= \lim_{x \rightarrow \infty} \frac{\sqrt{\frac{x^2}{x^2} - \frac{8x}{x^2} + \frac{15}{x^2}}}{-x \cdot \frac{1}{x}}$$

$$= \lim_{x \rightarrow \infty} \frac{\sqrt{1}}{1} = -1$$

$$k_2 = -1$$

GRAF ?

B4

$$x + 2y - z + v = 2$$

$$2x + 5y - z + 2v = 3$$

$$3x - y - 2z + v = 2$$

$$x - y + 3z - 5v = 2$$

$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 2 & 5 & -1 & 2 & 3 \\ 3 & -1 & -2 & 1 & 2 \\ 0 & -1 & 3 & -5 & 2 \end{array} \right] \begin{array}{l} \leftarrow [1 \cdot (-2)] + [1 \cdot 3] \\ \leftarrow [1 \cdot (-1)] + [1 \cdot 2] \end{array}$$

$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & -7 & 8 & -4 & -8 \\ 0 & -1 & 3 & -5 & 2 \end{array} \right] \begin{array}{l} \leftarrow [1 \cdot 7] + [1 \cdot (-1)] \\ \leftarrow [1 \cdot (-1)] + [1 \cdot (-1)] \end{array}$$

$$k_2 = (f(x) - kx)$$

$$k_2 = (\sqrt{x^2 - 8x + 15} + x)$$

$$k_2 = \frac{\sqrt{x^2 - 8x + 15} \cdot \sqrt{x^2 - 8x + 15} + x \cdot \sqrt{x^2 - 8x + 15}}{\sqrt{x^2 - 8x + 15}}$$

$$k_2 = \frac{(\sqrt{x^2 - 8x + 15})^2 - x^2}{\sqrt{x^2 - 8x + 15} - x} = \frac{x^2 - 8x + 15 - x^2}{\sqrt{x^2 - 8x + 15} - x}$$

$$k_2 = \frac{8x + 15}{\sqrt{x^2 - 8x + 15} - x} \cdot \frac{1/x}{1/x}$$

$$k_2 = \frac{8x + 15}{\sqrt{\frac{x^2}{x^2} - \frac{8x}{x^2} + \frac{15}{x^2}} - \frac{x}{x}}$$

$$k_2 = \frac{8}{\sqrt{1} - 1} = 0 \quad k_2 = 0$$

$$\left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 0 & 1 & 1 & 0 & -1 \\ 0 & 0 & 15 & -4 & -15 \\ 0 & 0 & 4 & -5 & -1 \end{array} \right] \begin{array}{l} \leftarrow [1 \cdot (-15)] \end{array}$$

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

NEMA RJEŠENJA

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

POPUNJAVA
NASTAVNIK
Broj ↓
bodova

23

IME I PREZIME: *Tomislav Čović*

VRIJEME POČETKA: *16:00*

MATIČNI BROJ STUDENTA (IZNAD SLIKE U INDEKSU):

Želim ustmeni kod (zaokružiti):

prof. Uglešića

asistenta Kosora

1. Za funkciju $f(x) = \sqrt{x^2 + 8x + 15}$ temeljem ispitivanja funkcijskog tijeka napraviti skicu grafa funkcije. 20 graf
2. Odrediti tok funkcije $f(x) = \frac{x^2 - 2}{x^2 + 3}$ i skicirati graf. 20 graf
3. Navesti posebno lokalne, a posebno globalne ekstreme funkcije $f(x) = 2^{x^2 - 3}$. Posebno komentirati (ne)ograničenost. 7+7+6
4. Gaussovom metodom riješiti matrični sustav: 12+3

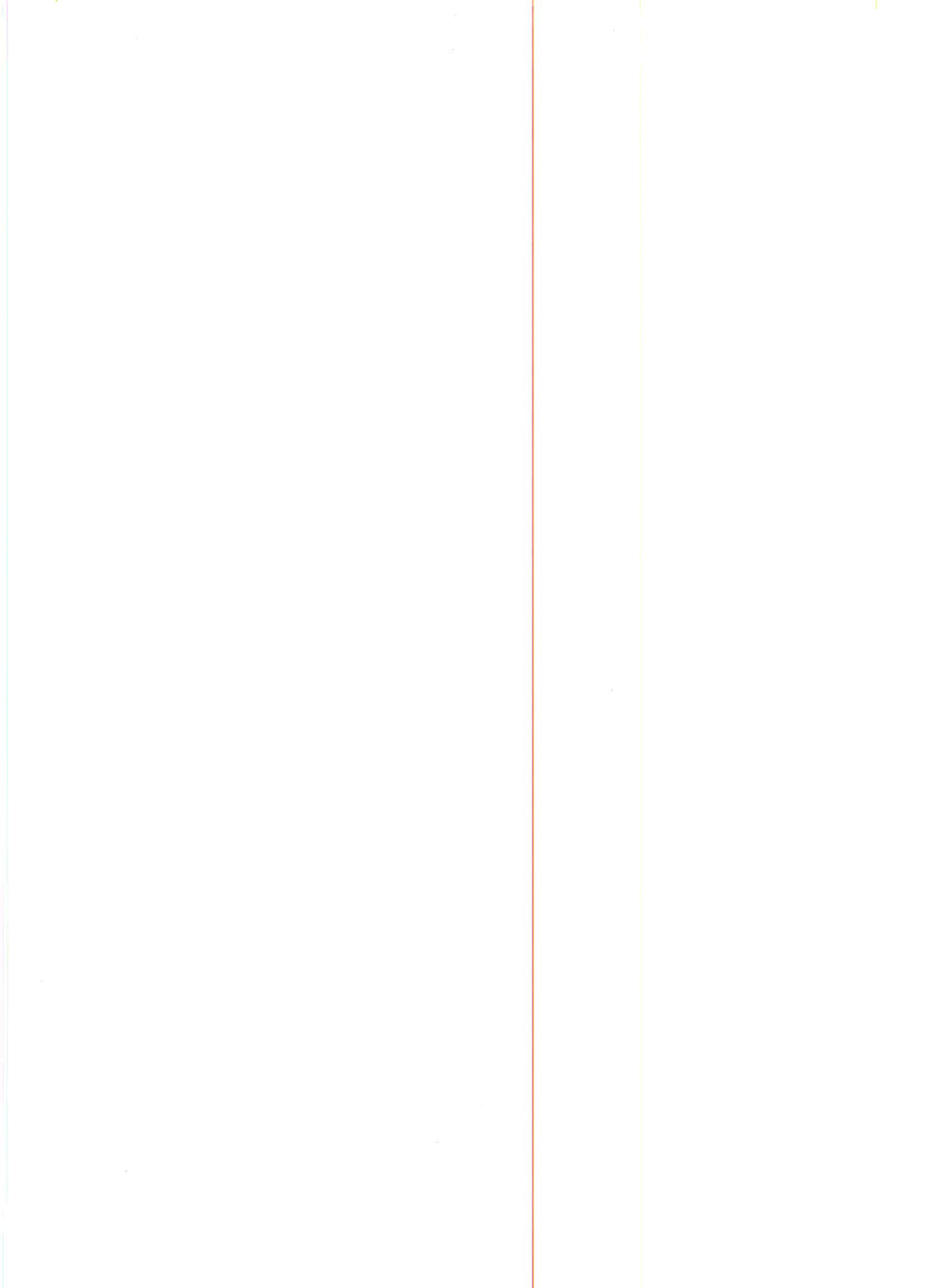
$$\begin{aligned}x + 2y - z + u &= 2 \\2x + 5y - z + 2u &= 3 \\3x - y - 2z + u &= 2 \\x - y + 3z - 5u &= 2\end{aligned}$$

Provjeri uvrštavanjem!

5. Ispitati domenu funkcije $g(x) = \frac{x}{\ln x}$. 15
6. Riješiti jednadžbu u kompleksnim brojevima: $z^3 = \frac{2 + 2i}{2 - 2i}$. 15

Ukupno:

0



$$6. z^3 = \frac{z+2i}{z-2i} \cdot \frac{z-2i}{z-2i} = \frac{(z-4i+4i-4i^2)}{(z-4i-4i+4i^2)} = \frac{z-4i^2}{z-8i+4i^2} \quad \times \quad \times$$

$$4. \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 2 & 5 & -1 & 2 & 3 \\ 3 & -1 & -2 & 1 & 2 \\ 1 & -1 & 3 & -5 & 2 \end{array} \right] \xrightarrow{(III+IV)} \sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 2 & 5 & -1 & 2 & 3 \\ 4 & -2 & -1 & 4 & 4 \\ 1 & -1 & 3 & -5 & 2 \end{array} \right] \xrightarrow{I \leftrightarrow IV} \sim \left[\begin{array}{cccc|c} 1 & 2 & -1 & 1 & 2 \\ 2 & 5 & -1 & 2 & 3 \\ -4 & 2 & -7 & 4 & -4 \\ 3 & 1 & 2 & -1 & -2 \end{array} \right] \quad \times$$

