Barem testare matematică
clasa X - 24.08.2026

I. 1) $(f\circ f)(x) = f((m-3)x-4n) = (m-3)[(m-3)x-4n]-4n$

$= (m-3)^2x - 4mn + 8n$ (0,4p)

$(m-3)^2x - 4mn + 8n = 4x - 12, (\forall)x\in\mathbb{R}$

$\begin{cases} (m-3)^2 = 4 \\ -4mn+8n=-12 \end{cases} \Leftrightarrow \begin{cases} m-3=\pm 2 \\ -4mn+8n=-12 \end{cases}$ (0,4p)

I. $m-3=2 \Rightarrow m=5$

$n=1$ (0,1p)

II. $m-3=-2 \Rightarrow m=1$ (0,1p)

$n=-3$

$(m,n)\in\{(5,1),(1,-3)\}$.

2.) $a=1>0 \Rightarrow V\left(-\frac{b}{2a}, -\frac{\Delta}{4a}\right)$ punct de minim (0,2p)

$\Delta = 24$ (0,1p)

$V(1,-6)$ (0,3p)

$\left.\begin{array}{l} x_V = 1>0 \\ y_V=-6<0 \end{array}\right| \Rightarrow V\in C_{IV}$ (0,4p)

3.)

x	$-\infty$ $\frac{2}{3}$ 2 3 $+\infty$	
$2-3x$	+ + + 0 − − − − − − −	(0,2p)
x^2-5x+6	+ + + + 0 − − 0 + + +	(0,2p)
$\frac{2-3x}{x^2-5x+6}$	+ + + 0 − − − | + + + | − − −	(0,3p)

$x\in\left(-\infty, \frac{2}{3}\right]\cup(2,3)$ (0,3p)

4.) $\vec{u}, \vec{v}$ coliniari $\Leftrightarrow \frac{x_1}{x_2} = \frac{y_1}{y_2}$ (0,1p)

$$\frac{2a-3}{a+1} = \frac{-(a-4)}{6}$$ (0,2p)

$$a^2+9a-22=0.$$ (0,1p)

$\Delta = 169$ (0,1p)

$a_1 = 2$ (0,1p)

$a_2 = -11$ (0,1p)

$a \in \{-11, 2\}$

5.) $\vec{AC} = (x_C - x_A)\vec{i} + (y_C - y_A)\vec{j} =$

$= x_C \cdot \vec{i} + (y_C - 2)\vec{j}$ (0,2p)

$\vec{OB} = 6\vec{i} + 4\vec{j}$ (0,2p)

$2x_C\vec{i} + (2y_C - 4)\vec{j} = 6\vec{i} + 4\vec{j}$ (0,1p)

$$\begin{cases} 2x_C = 6 \\ 2y_C - 4 = 4 \end{cases}$$ (0,3p)

$$\begin{cases} x_C = 3 \\ y_C = 4 \end{cases} \Rightarrow C(3,4)$$ (0,2p)

II. 6.) G_f este tangent axei $Ox \Leftrightarrow \Delta = 0$ (0,3p)

$\Delta = 8 - 4m$ (0,4p)

$\Delta = 0 \Rightarrow m = 2$ (0,3p)

7.) $\begin{cases} S = x_1 + x_2 = -\frac{b}{a} = \frac{3}{2} \\ P = x_1 x_2 = \frac{c}{a} = 3 \end{cases}$ (0,4p)

$x_1^3 + x_2^3 = S(S^2 - 3P) =$ (0,3p)

$= -\frac{81}{8}$ (0,3p)

8.) $\left.\begin{array}{l} \sin^2 x + \cos^2 x = 1 \Rightarrow \cos x = \pm \frac{3}{5} \\ x \in C_{II} \Rightarrow \cos x < 0 \end{array}\right| \Rightarrow \cos x = -\frac{3}{5}$ (0,2p)

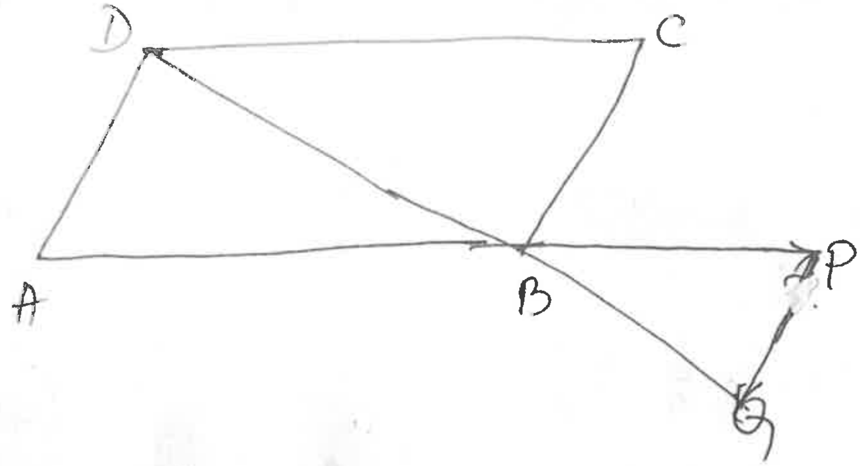
$\left.\begin{array}{l} \sin^2 y + \cos^2 y = 1 \Rightarrow \sin y = \pm\sqrt{\frac{2}{3}} = \pm \frac{\sqrt{6}}{3} \\ y \in C_{III} \Rightarrow \sin y < 0 \end{array}\right| \Rightarrow \sin y = -\frac{\sqrt{6}}{3}$ (0,2p)

$\sin 2x = 2 \sin x \cos x = -\frac{24}{25}$ (0,2p)

$\sin(x+y) = \sin x \cos y + \sin y \cos x = \frac{-4\sqrt{3}+3\sqrt{6}}{15}$ (0,2p)

$\cos(x-y) = \cos x \cos y + \sin x \sin y = \frac{3\sqrt{3}-4\sqrt{6}}{15}$ (0,2p)

9.)



Desen (0,2p)

În ΔBPQ, $\overrightarrow{BQ} = \overrightarrow{BP} + \overrightarrow{PQ} =$ (0,2p)

$= \frac{1}{2}\overrightarrow{DC} + \frac{1}{2}\overrightarrow{CB} =$ (0,2p)

$= \frac{1}{2}(\overrightarrow{DC} + \overrightarrow{CB}) =$

$= \frac{1}{2}\overrightarrow{DB}$ (0,2p)

$\Rightarrow \overrightarrow{BQ}$ și $\overrightarrow{DB}$ sunt coliniari (0,1p)

$\Rightarrow D, B, Q$ sunt coliniare. (0,1p)

Se acordă 1 p din oficiu

Barem testare matematică
clasa XI - 24.08.2026

I. 1) $\sqrt[5]{3^3\cdot\sqrt[3]{3^5}} : \sqrt[6]{3^2\cdot 3^4\cdot 3^{\frac{1}{2}}} =$ (0,2p)

$= \sqrt[5]{3^3\cdot 3^{\frac{5}{3}}} : \sqrt[6]{3^{\frac{13}{2}}} =$ (0,2p)

$= \sqrt[5]{3^{\frac{14}{3}}} : 3^{\frac{13}{12}} =$ (0,2p)

$= 3^{\frac{14}{15}} : 3^{\frac{13}{12}} =$ (0,2p)

$= 3^{-\frac{9}{60}} = 3^{-\frac{3}{20}}$ (0,2p)

2.) a.) $\sin 2x = \frac{1}{2}$

$2x = (-1)^k\cdot \arcsin\frac{1}{2} + k\pi,\ k\in\mathbb{Z}.$ (0,3p)

$x = (-1)^k\cdot\frac{\pi}{12} + \frac{k\pi}{2},\ k\in\mathbb{Z}.$ (0,1p)

$k=0 \Rightarrow x=\frac{\pi}{12}\in[0,\pi]$ (0,2p)

$k=1 \Rightarrow x=\frac{5\pi}{12}\in[0,\pi]$ (0,2p)

$k=2 \Rightarrow x=\frac{13\pi}{12}\notin[0,\pi]$ (0,2p)

$S=\left\{\frac{\pi}{12}, \frac{5\pi}{12}\right\}$

b.) $(\sqrt{5^x})^2 - 6\cdot\sqrt{5^x} + 5 = 0$ (0,2p)

Notăm $\sqrt{5^x}=t,\ t>0$ (0,1p)

$t^2-6t+5=0$ (0,2p)

$t_1=1\in(0,\infty)$ (0,1p)

$t_2=5\in(0,\infty)$ (0,1p)

$I\ t_1=1 \Rightarrow \sqrt{5^x}=1 \Rightarrow x=0$ (0,1p)

$II\ t_2=5 \Rightarrow \sqrt{5^x}=5 \Rightarrow 5^x=5^2 \Rightarrow x=2$ (0,1p)

$S=\{0,2\}$. (0,1p)

c.) CE: $\begin{cases} x^2+6x-12>0 \\ x>0 \end{cases}$ (0,2p)

$\log_3(x^2+6x-12)=\log_3 7x$ (0,1p)

inj. $\Rightarrow x^2+6x-12=7x$ (0,2p)

$x^2-x-12=0$ (0,1p)

$x_1=-3$ nu convine (0,2p)

$x_2=4$ convine (0,2p)

$S=\{4\}$.

II. 1) Fie $z=a+bi$, $a,b\in\mathbb{R} \Rightarrow \bar{z}=a-bi$ (0,1p)

$(2-i)(a+bi)=4i+a-bi$ (0,1p)

$2a+b+i(2b-a)=a+i(4-b)$ (0,2p)

$\begin{cases} 2a+b=a \\ 2b-a=4-b \end{cases}$ (0,2p)

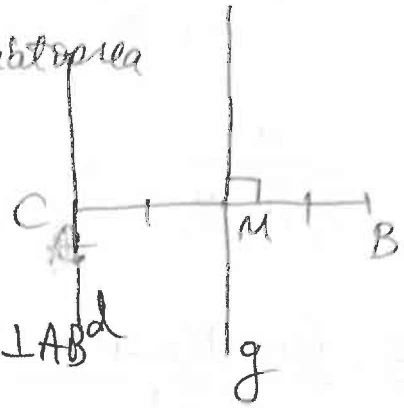
$\begin{cases} a+b=0 \\ -a+3b=4 \end{cases}$ (0,1p)

$a=-1$ (0,2p)

$b=1$

$z=-1+i$ (0,1p)

2.) Fie M mijlocul lui AB, dreapta $g \perp AB$ a.î. $M \in g \Rightarrow g$ e mediatoarea segmentului AB.



Fie dreapta $d \parallel g$, $C \in d$ / Dar $g \perp AB$ / $\Rightarrow d \perp AB$ (0,2p)

$\Rightarrow m_d \cdot m_{BC} = -1$ (0,2p)

$m_{BC} = \dfrac{y_B - y_C}{x_B - x_C} = 1$ | $\Rightarrow m_d = -1$ (0,2p)

$d: y - y_C = m_d (x - x_C)$ (0,2p)

$d: y - 3 = -(x - 1)$

$d: y = -x + 4$ (0,2p)

3.) Fie $\text{card} A = n$, $n \in \mathbb{N}^*$

$C_n^0 + C_n^1 + C_n^2 = 16$ (0,3p)

$C_n^0 = 1$ (0,1p)

$C_n^1 = n$ (0,1p)

$C_n^2 = \dfrac{n(n-1)}{2}$ (0,1p)

(0,2p)

$n^2 + n - 30 = 0$

$n_1 = 5 \in \mathbb{N}^*$

$n_2 = -6 \notin \mathbb{N}^*$ (0,2p)

$n = 5$

4. $CE: \begin{cases} n \geq 3 \\ n+2 \geq 4 \\ n \in \mathbb{N}^* \end{cases} \Rightarrow n \in \{3, 4, 5, 6, \dots\}$ (0,2p)

5. $\frac{n!}{3!\,(n-3)!} = \frac{(n+2)!}{4!\,(n-2)!}$ (0,2p)

5. $\frac{(n-2)(n-1)\,n}{3!} = \frac{(n-1)\,n\,(n+1)(n+2)}{4!}$ (0,2p)

$4 \cdot 5(n-2) = (n+1)(n+2)$ (0,1p)

$n^2 - 17n + 42 = 0$ (0,1p)

$n_1 = 14$ convine (0,1p)

$n_2 = 3$ convine (0,1p)

$n \in \{3; 14\}$

5. $T_{k+1} = C_{40}^{k} \cdot \left(\sqrt[4]{3}\right)^{40-k} \cdot 2^{k}$ (0,3p)

$= C_{40}^{k} \cdot 3^{\frac{40-k}{4}} \cdot 2^{k} \in \mathbb{Q}$ (0,1p)

$\Rightarrow \begin{cases} \frac{40-k}{4} \in \mathbb{Z} \\ k \in \{0, 1, 2, \dots, 40\} \end{cases}$ (0,3p)

$\Rightarrow k \in \{0, 4, 8, \dots, 40\}$ (0,2p)

$\Rightarrow$ 11 termeni raționali (0,1p)

Barem testare matematică
clasa $\overline{XII}$ – 24.08.2026.

I. a) $A(a)$ nu este inversabilă $\Leftrightarrow \det(A(a))=0$ (0,3p)

$\det A(a) = 5a-15$ (0,4p)

$\det A(a) = 0 \Rightarrow a = 3 \in \mathbb{R}$ (0,3p)

b.) $A(-1) = \begin{pmatrix} -1 & 1 & -2 \\ 2 & 1 & 3 \\ -3 & 2 & 1 \end{pmatrix}$ (0,1p)

$\det A(-1) = -20 \neq 0 \Rightarrow A(-1)$ este inversabilă (0,1p)

$\left(A(-1)\right)^{-1} = \frac{1}{\det A(-1)} \cdot A^*(-1)$ (0,1p)

$A^*(-1) = \begin{pmatrix} -5 & -5 & 5 \\ -11 & -7 & -1 \\ 7 & -1 & -3 \end{pmatrix}$ (0,6p)

$\left(A(-1)\right)^{-1} = \begin{pmatrix} \frac{1}{4} & \frac{1}{4} & -\frac{1}{4} \\ \frac{11}{20} & \frac{7}{20} & \frac{1}{20} \\ -\frac{7}{20} & \frac{1}{20} & \frac{3}{20} \end{pmatrix}$ (0,1p) c.) $a=3 \Rightarrow \det A(3)=0 \Rightarrow \operatorname{rang} A(3) \leq 2$ (0,2p)

$\Delta_p = \begin{vmatrix} 3 & 1 \\ 2 & 1 \end{vmatrix} = 1 \neq 0 \Rightarrow \operatorname{rang} A(3) = 2$ (0,2p)

$\Delta_C = \begin{vmatrix} 3 & 1 & 2 \\ 2 & 1 & 1 \\ 5 & 2 & 3 \end{vmatrix} = 0 \Rightarrow$ sistemul este compatibil nedeterminat (0,3p)

x, y necunoscute principale

z necunoscută secundară (0,2p)

ec. 1, 2 principale

ec. 3 secundară

Fie $z = \alpha$ (0,1p)

$$\begin{cases} 3x + y - 2\alpha = 2 \\ 2x + y + 3\alpha = 1 \end{cases}$$ (0,2p)

$x = 1 + 5\alpha$.

$y = -1 - 13\alpha$.

$S = \{(1+5\alpha, -1-13\alpha, \alpha)\}, (\forall)\, \alpha \in \mathbb{R}$ (0,3p)

Dar $x_0^2 + y_0^2 = 0$, $x_0^2 \geq 0$, $y_0^2 \geq 0$ $\Rightarrow \begin{cases} x_0 = 0 \\ y_0 = 0 \end{cases} \Rightarrow \begin{cases} 1+5\alpha = 0 \\ -1-13\alpha = 0 \end{cases}$ sistemul nu are soluții (0,5p)

$\Rightarrow$ nu există soluție care verifică relația dată

II. a.) $f'(x) = [(x+2)^2]' \cdot e^{-x} + (x+2)^2 \cdot (e^{-x})'$ (0,3p)

$f'(x) = 2(x+2)e^{-x} + (x+2)^2 \cdot (-e^{-x})$ (0,3p)

$f'(x) = (x+2)e^{-x}\left(2 - x - 2\right)$ (0,2p)

$f'(x) = -x(x+2)e^{-x}$ (0,2p)

b.) $\lim\limits_{x\to\infty} f(x) \overset{\infty\cdot 0}{=\!=} \lim\limits_{x\to\infty} \dfrac{(x+2)^2}{e^x} =$ (0,3p)

$\underset{L'H}{\overset{\frac{\infty}{\infty}}{=}} \lim\limits_{x\to\infty} \dfrac{2(x+2)}{e^x} \underset{L'H}{\overset{\frac{\infty}{\infty}}{=}}$ (0,2p)

$= \lim\limits_{x\to\infty} \dfrac{2}{e^x} = \dfrac{2}{\infty} = 0$ (0,2p)

$\Rightarrow$ dreapta de ecuație $y = 0$ este asimptotă orizontală spre $+\infty$. (0,3p)

c.) Tangenta în $x_0 = a$ este paralelă cu Ox

$\Rightarrow$ $m_{tg} = m_{Ox}$ (0,1p)

$m_{tg} = f'(x_0) = f'(a)$ $\Rightarrow$ (0,1p)

$m_{Ox} = 0$ (0,1p)

$\Rightarrow f'(a) = 0.$ (0,1p)

$-a(a+2)e^{-a}=0$

Dar $e^{-a}>0$, $(\forall)\, a\in\mathbb{R}$ (0,2p) $\Rightarrow a_1=0\in\mathbb{R}$ (0,2p)

$a_2=-2\in\mathbb{R}$ (0,2p)

d.) $f'(x)=0 \stackrel{c}{\Rightarrow} x_1=0\in[-2,\infty)$ (0,2p)

$x_2=-2\in[-2,\infty)$

x	-2		0		$+\infty$
$f'(x)$	0	$+\ +\ +\ +$	0	$-\ -\ -$	
$f(x)$	0	$\nearrow$	4	$\searrow$	0

(0,5p)

Dacă $x\in[-2,0]\Rightarrow f'(x)\geq 0\Rightarrow f$ este crescătoare pe $[-2,0]$ (0,2p)

Dacă $x\in[0,\infty)\Rightarrow f'(x)\leq 0\Rightarrow f$ este descrescătoare pe $[0,\infty)$ (0,2p)

$x=0$ este punct de maxim $\Rightarrow f(x)\leq f(0)$, $(\forall)\, x\in[-2,\infty)$

$\Rightarrow f(x)\leq 4$ (0,1p)

$x=-2$ este punct de minim $\Rightarrow f(x)\geq f(-2)$, $(\forall)\, x\in[-2,\infty)$

$\Rightarrow f(x)\geq 0$ (0,1p)

$0\leq f(x)\leq 4$, $(\forall)\, x\in[-2,\infty)$ (0,1p)

$$0 \le (x+2)^2 e^{-x} \le 4, \ (\forall)\, x \in [-2, \infty)$$

$$0 \le (y+2)^2 e^{-y} \le 4, \ (\forall)\, y \in [-2, \infty) \quad (0{,}2p)$$

$$0 \le (x+2)^2 \cdot (y+2)^2 \cdot e^{-x} \cdot e^{-y} \le 16. \quad (0{,}1p)$$

$$0 \le \frac{[(x+2)(y+2)]^2}{e^{x+y}} \le 16 \ \Big| \sqrt{\ } \quad (0{,}2p)$$

$$0 \le \frac{(x+2)(y+2)}{\sqrt{e^{x+y}}} \le 4, \ (\forall)\, x, y \in [-2, \infty)$$

$(0{,}1p)$