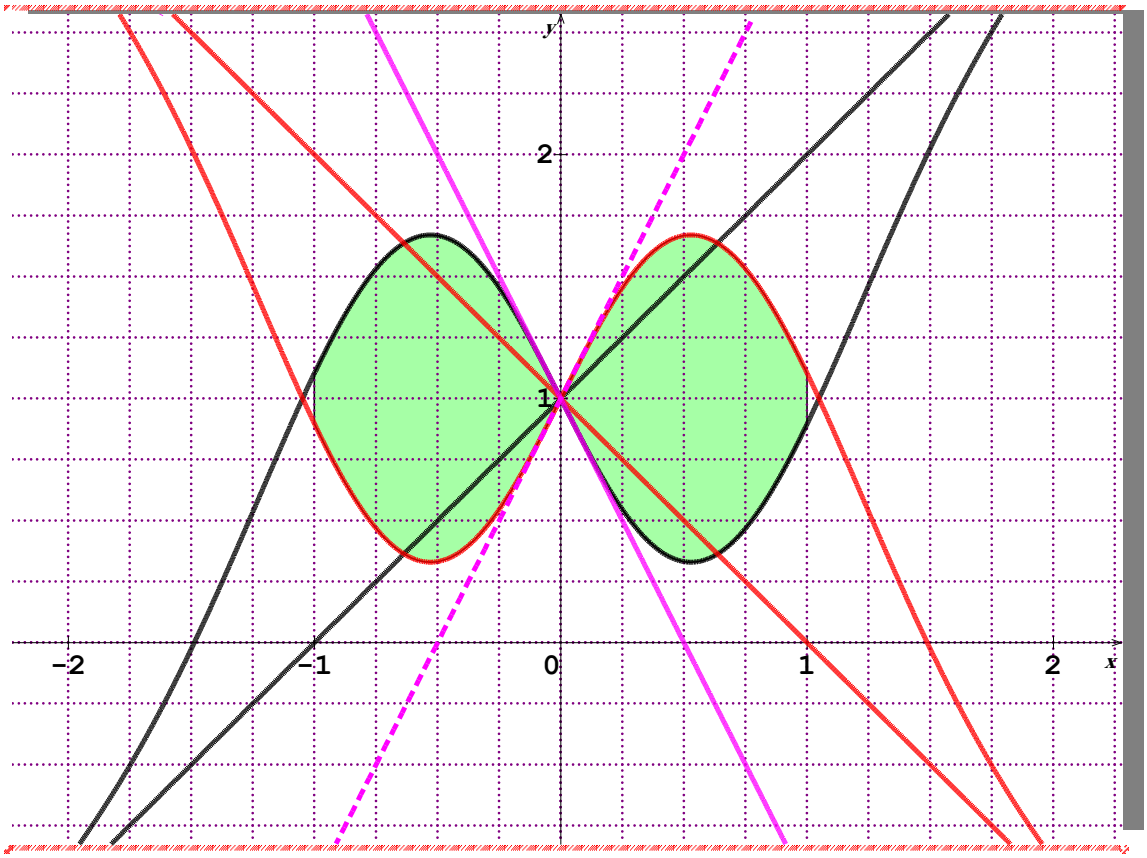
2020



BAC2020

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05

$\begin{cases} \alpha - 2\beta = 3 + (2-\sqrt{3})i \\ \overline{\alpha} + 4\overline{\beta} = -2(1+\sqrt{3})i \end{cases}$ β α I

C B A (O, u, v) II

$z_C = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$ $z_B = -\sqrt{2} + i\sqrt{6}$ $z_A = 2 + 2i$

B A z_B z_A 1

B C A C B 2

$\sin\left(\frac{7\pi}{12}\right)$ $\cos\left(\frac{7\pi}{12}\right)$ $\frac{z_B}{z_A}$ 4

$\frac{\pi}{2}$ O r 5

r B D z_D

r **C** E z_E

BDE C (EB) (DC)

04

$u_{n+1} = \sqrt{\frac{u_n^{\,2}}{2} + \frac{1}{2}}$ n $u_0 = 3$ (u_n)

$1 < u_n \leq 3$ n **1**

(u_n) u_{n+1} u_n

(u_n)

$v_n = u_n^{\,2} - 1$ n (v_n) **2**

(v_n)

$\lim\limits_{n\to+\infty} u_n$ n u_n

$\lim\limits_{n\to+\infty} S_n$ $S_n = u_n^2 + u_{n+1}^2 + \ldots\ldots + u_{n+2020}^2$ S_n n

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04

1 0 1 9

0 1 1 0 1 1

B A 1

C

B A $A \cap B$ A

X **2**

X

X E(X)

$P(e^X - 1 \leq 0)$

07

$g(x) = \frac{x}{x+1} + \ln(x+1)$ $]-1;+\infty[$ g **I**

g $\lim_{x \to +\infty} g(x)$ $\lim_{x \xrightarrow{>} -1} g(x)$ **1**

$]-1;+\infty[$ $g(x)$ $g(0)$ **2**

. $f(x) = |x|\ln(x+1)$ $]-1;+\infty[$ x f **II**

$(O;i;j)$ f (C_f)

0 f **1**

$\lim_{x \xrightarrow{>} -1} f(x)$ $\lim_{x \to +\infty} f(x)$ **2**

$]-1;0[$ $f'(x)$ $f'(x) = g(x)$ $x \geq 0$ **3**

f

1 (C_f) (Δ) **4**

$y = x$ (D) (C_f)

(C_f) (D) (Δ) **5**

$H(x) = x^2 - 2x - 2(x^2 - 1)\ln(x+1)$ $[0;+\infty[$ H **6**

$[0;+\infty[$ f H

$x = e - 1$ $x = 0$ $y = x$ (C_f)

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z_0 2 z $z^3 - 2z^2 + 16 = 0$ 1

S = 2, 4 + 2i, 4 - 2i S = -2, 4 + 2i, 4 - 2i S = -2, 2 + 2i, 2 - 2i

OAB z_B 2 2i $z_A = 2 + 2i$ B, A 2

O O

$z = e^{i\frac{\pi}{3}}z$ T 3

$\arg(z - z_A)$ $\arg(iz - z_B)$ M (T) 4

iz_B A, B AB AB (AB)

04

3 2 7 $\mathbf{v}_1$ (I

1

3 B A

2 3 5 $\mathbf{v}_2$ (II

n $\mathbf{v}_1$

$\mathbf{v}_1$ n $\mathbf{v}_2$

$\frac{1}{35}$ 1

$\mathbf{v}_1$ 3 2

3 3

x 4

x

$P(|X| \leq 1)$

04

C 1;0;1 B 2; 1;1 A 1;1;0 $(O;i;j;k)$

ABC C B A 1

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ABC n 1;3;5

ABC D 1; 1;0 2

ABC D H

EF P F 3;1;0 E 1;0;1 3

2x y z 4 0 P

ABC P

ABC P

D ABC P D 4

07

$g(x)=1+xe^{x}$ g **I**

$g(x)$ g

$f(x)=e^{2x}+(x+1)e^{x}+x$ f **II**

$2cm$ $(o;i,j)$

$\lim\limits_{x\to-\infty}\left(f(x)-x\right)$ $\lim\limits_{x\to+\infty}f(x)$ $\lim\limits_{x\to-\infty}f(x)$ **1**

$f'(x)=2e^{x}(e^{x}+1)+g(x)$ f $f'(x)$ **2**

f $f'(x)$

$e^{\alpha}=-\alpha$ $-0.6\le\alpha\le-0.5$ α $f(x)=0$ **3**

0 (C_f) (Δ) **4**

$-1.3\le\beta\le-1.0$ β $e^{x}+x+1=0$ **5**

$y=x$ (D) (C_f)

(C_f) (Δ) (D) **6**

$f(x)=(e^{x}+x)(e^{x}+1)$ x **7**

$x=0$ $x=\alpha$ (C_f) $\mathscr{A}$

(C_h) $h(x)=f\left(\ln x\right)$ $]0;+\infty[$ h **III**

$h(x)$

h **1**

(C_h) **3**

1 (C_h) (T)

(C_h) $h(-1-\beta)$

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$(O;u,v)$

$z_C=\sqrt{3}+i \qquad z_B=-\sqrt{3}+i \qquad z_A=-2i$ C B A

$z_C \quad z_B \quad z_A$ 1

C B A (γ)

(γ) C B A

ABC $\dfrac{z_B-z_A}{z_C-z_A}$ 2

$\dfrac{\pi}{3}$ A r 1

r O $-\sqrt{3}-i$ O′

r (γ) (γ') (γ) $[O'C]$

B A (γ') (γ)

04

0 1 8

2 1 1

1

A

C B

X

X

$E(X^2)$ X^2

$1\le n\le 9$ n 2

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" " n P(D)

$$P(D)=\frac{7}{15}$$ n

04

$$u_{n+2}=\frac{2}{5}u_{n+1}-\frac{1}{25}u_n \quad ,u_1=1 \quad u_0=0$$ (u_n)

$$w_n=5^n u_n \quad v_n=u_{n+1}-\frac{1}{5}u_n \quad n\in$$

n v_n (v_n) 1

5 (w_n) 2

n u_n n w_n

0 u_{n+1} $\frac{2}{5}u_n$ $n\in$ * 3

(u_n) $n\in$ * 0 u_n $\left(\frac{2}{5}\right)^{n-1}$

$$S_n=(w_0-v_0)+(w_1-v_1)+.....+(w_n-v_n)$$ n 4

07

$$g(x)=-2x^3+x^2-1$$ g I

g 1

$-0,7$ α $-0,6$ α $g(x)=0$ 2

g(x) 3

$$f(x)=\left(1+x+x^2+x^3\right)e^{-2x+1}$$ f II

$\|j\|=1cm$ $\|i\|=2cm$ (O,i,j) (C_f)

1 x x^2 x^3 x 1 2

0 f(x) $4x^3.e^{-2x+1}$ x 1

$$\lim_{x\to+\infty}\frac{x^3}{e^x}=0 \qquad \lim_{t\to+\infty}\frac{t}{e^t}=0$$

$\lim_{x\to+\infty} f(x)$ 2

$f'(x)=g(x).e^{-2x+1}$ x 3

f $\lim_{x\to-\infty} f(x)$

f(α) 5 (C_f) f(0) f(−1) f(−1,1) 4

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b a $\begin{cases} a+b=2 \\ ab=4 \end{cases}$ b a **1**

D C B A $(O;u;v)$ **2**

$z_D=-2$ $z_C=z_A^2$ $z_B=\overline{z}_A$ $z_A=1+i\sqrt{3}$

$\left(z_A\right)^{2019}=2^{2018}z_D$

ACD $\dfrac{z_C-z_D}{z_A-z_D}$

D C B A

C A O S **3**

$[AD]$ I $S(I)=D$

$ACDB$ z_C+z_B

θ $2z=z_A+2e^{i\theta}$ z M $(\mathscr{C})$ **4**

S $(\mathscr{C})$ $(\mathscr{C})$ $(\mathscr{C})$

04

$C(-1;1;1)$ $B(1;1;4)$ $A(1;0;2)$ $(O;i;j;k)$

C B A 1

(ABC) $n(3;4;-2)$

$x-2y+6z=0$ $2x+y+2z+1=0$ (P_2) (P_1) 2

(D) (P_2) (P_1)

(ABC) (D)

$\{(A;1),(B;2),(C;t)\}$ G t 3

$t\in\ ^*_+$ G

$(k\in\ ^*)$ $IG=kIC$ G I $\{(A;1),(B;2)\}$ I

C $[IC]$ $^*_+$ t G

$[IC]$ J G t

04

$\begin{cases} v_0=7 \\ v_{n+1}=\dfrac{2u_n+3v_n}{5} \end{cases}$ $\begin{cases} u_0=-2 \\ u_{n+1}=\dfrac{4u_n+v_n}{5} \end{cases}$ (v_n) (u_n)

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v_2 u_2 v_1 u_1 **1**

$w_n = v_n - u_n$ n **2**

(w_n)

$\lim\limits_{n\to+\infty} w_n$ n

(v_n) (u_n) **3**

l (v_n) (u_n)

$t_n = 4u_n + 5v_n$ (t_n) **4**

l (t_n)

07

$g(x) = -\dfrac{1}{x+1} + \ln|x+1|$ $\mathbb{R}\setminus\{-1\}$ g **I**

$\lim\limits_{x\to+\infty} g(x)$ $\lim\limits_{x\to-\infty} g(x)$ $\lim\limits_{x\xrightarrow{>}-1} g(x)$ $\lim\limits_{x\xrightarrow{<}-1} g(x) = +\infty$ **1**

g **2**

$0.7 < \alpha < 0.8$ $]-1;+\infty[$ α $g(x) = 0$ **3**

$g(x)$ x

$f(x) = x\left(-1 + \ln|x+1|\right)$ $\mathbb{R}\setminus\{-1\}$ f **II**

(O,i,j) (C_f)

$\lim\limits_{x\to-1} f(x) = +\infty$ $\lim\limits_{x\to+\infty} f(x)$ $\lim\limits_{x\to-\infty} f(x)$ **1**

f f' $f'(x) = g(x)$ $\mathbb{R}\setminus\{-1\}$ x **2**

f

(C_f)

(T) (C_f) O (C_f) (T) **3**

(C_f) $f(x) = 0$ **4**

$I(-2;2)$ (C_f) $y = x + 4$ (D)

I (C_f) (T) (D) (T)

(C_f) (D) (T)

$F(x) = \left(\dfrac{x^2-1}{2}\right)\ln(x+1) - \left(\dfrac{x-1}{2}\right)^2$ $]-1;+\infty[$ F **5**

$]-1;+\infty[$ $x\ln(x+1)$

(C_f) $A(\lambda)$ $-1 < \lambda < 0$ λ

$\lim\limits_{\lambda\xrightarrow{>}-1} A(\lambda)$ $x = 0$ $x = \lambda$

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(u_n) $u_1 = \frac{1}{2}$ $u_{n+1} = \frac{n+1}{2n}u_n$ n

1 u_n 0 n

(u_n)

(u_n)

2 $v_n = \frac{u_n}{n}$ n

(v_n) v_1

$u_n = \frac{n}{2^n}$ n $\lim\limits_{x\to+\infty} u_n = 0$

04

1 $z^2 - 2z + 4 = 0$

1 1 $\left(\overline{z} + 2 + 2i\sqrt{3}\right)^2 - 2\overline{z} - 4i\sqrt{3} = 0$

2 $(O;u;v)$ D C B A

$z_A = 1 + i\sqrt{3}$ $z_B = -1 + 3i\sqrt{3}$ $z_C = -1 + i\sqrt{3}$ $z_D = -1 - i\sqrt{3}$

ABD z_{AB} z_{AD}

B $\frac{2\sqrt{3}}{3}$ $-\frac{\pi}{6}$ S

S C E z_E

ABED $z = \frac{z_B - z_E}{z_A - z_E}$

04

6

4

3

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X **1**

X

X

2

A_2 A_1 A_0

4 **3**

B_2 B_1 B_0

$P(B_0)$ $P_{A_2}(B_0)$ $P_{A_1}(B_0)$ $P_{A_0}(B_0)$

07

(O,i,j)

C_g $g(x)=\ln(x^2+x+1)-x$ g

$-\infty$ $+\infty$ g -1

g $g'(x)=\dfrac{x(1-x)}{x^2+x+1}$ $x\in$ -2

$]1.7,1.9[$ α $g(x)=0$ -4

$g(x)$ $x\in$ -5

C_f $f(x)=\ln(x^2+x+1)$ f

$-\infty$ $+\infty$ f -1

f

(T) C_f (T)

$\ln(x^2+x+1)=0$ -2

C_f

(T) C_f $f(\alpha)=\alpha$ 3

$$S(\alpha)=2\int_0^{\alpha}\frac{xdx}{x^2+x+1}+\int_0^{\alpha}\frac{dx}{x^2+x+1}$$ -4

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05

$(O;i;j;k)$

$D(0;4;-1)$ $C(6;-2;-1)$ $B(6;1;5)$ $A(3;-2;2)$

ABC **1**

(AB) A (P) **2**

(ABC) (P)

(ABC) D A **3**

$ABCD$

$\frac{\pi}{4}$ BDC **4**

BDC

(BDC) A

04

$(O;i;j)$

$(z \quad 2 \quad 2i)(z^2 \quad 4z \quad 8) \quad 0$ 1

$z_C \quad 2 \quad 2i \; z_B \quad 2 \quad 2i \; z_A \quad 2 \quad 2i$ $C \; B \; A$

$\frac{}{2}$ A 2

$z_D \quad 2 \quad 6i$ C D

$ABCD$

$(A,1);(B, \quad 1);(C, \quad)$ H 3

H

M 2

$MA^2 \quad MB^2 \quad 2MC^2 \quad 16$

04

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

$\begin{cases} v_0 = \frac{9}{2} \\ v_{n+1} = f(v_n) \end{cases}$ و $\begin{cases} u_0 = -\frac{1}{2} \\ u_{n+1} = f(u_n) \end{cases}$ (C)

(v_n) (u_n)

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$y = x$ (C) 1

v_2 v_1 v_0 u_2 u_1 u_0

(v_n) (u_n) 2

$u_n < 3 < v_n$ n

$v_n = \frac{3}{2}\left(\frac{1}{2}\right)^n + 3$ $u_n = \frac{-7}{2}\left(\frac{1}{2}\right)^n + 3$ n 3

(v_n) (u_n)

$\lim v_n$ $\lim u_n$

(v_n) (u_n) 4

07

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

g 1

$\ln 4$ α $\ln 6$ α $g(x) = 0$ 2

x $g(x)$ 3

$f(x) = \frac{1 - e^x}{x^2}$ * f II

$(O; i, j)$ f (C_f)

$\lim_{x \to +\infty} f(x)$ $x = 2t$ $\lim_{x \to +\infty} \frac{e^x}{x^2} = +\infty$ 1

$\lim_{x \to 0} f(x)$ $\lim_{x \to 0} f(x)$ $\lim_{x \to -\infty} f(x)$ 2

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

$f'(x) = \frac{e^x . g(x)}{x^3}$ $x \in$ * * f

f f

$]-\infty; 0[\cup]0; 5]$ (C_f) 4

$u_{n+1} = 2\left(1 - e^{-u_n}\right)$ $u_0 = 1$ (u_n) III

$1 \le u_n \le \alpha$ $n \in$

$u_{n+1} - u_n = g(u_n)$ $n \in$

(u_n) (u_n)

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04

(u_n) $u_0 = e$ n $u_{n+1} = \dfrac{eu_n + 1}{u_n + e}$

1 a b $u_{n+1} = a + \dfrac{b}{u_n + e}$

2 $u_n \leq e$ n 1

3 (u_n)

4 (v_n) N $v_n = \left(\dfrac{e-1}{e+1}\right)^{n+1}$

(v_n) (v_n)

n $u_n = \dfrac{v_n + 1}{1 - v_n}$ $\lim\limits_{n \to +\infty} u_n$

n $S_n = \dfrac{1}{u_{1441} + 1} + \dfrac{1}{u_{1442} + 1} + \quad + \dfrac{1}{u_{2020} + 1}$

05

U_1 U_2 U_1 U_2

1 A 4

E

$\dfrac{23}{50}$

2 X

. X

3 10 DA 25 DA

U_2

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04

I z $\bar{z}$ $z\bar{z}-4z+\bar{z}+(z-\bar{z})i-3+5i=0$

II $(O;i;j)$ A B C D E

$z_A=1$ $z_B=4+i$ $z_C=3i$ $z_D=-1+i$ $z_E=-2i$

1 $\dfrac{z_C-z_A}{z_B-z_A}=\dfrac{z_E-z_A}{z_D-z_A}$

2 C s A $\dfrac{\pi}{4}$ $\dfrac{\sqrt{2}}{2}$

3 I_1 I_2 I_3 I_4 $[BC]$ $[CD]$ $[DE]$ $[EB]$

r I_1 I_4 I_2

$z_{I_1}+z_{I_3}$ $z_{I_2}+z_{I_4}$ $I_1I_2I_3I_4$

07

I g $g(x)=-1+(x+1)^2e^x$

1 g

2 $g(0)$ $g(x)$

II f $f(x)=(x^2+1)e^x$

(C_f) $(O;i;j)$

1 $\lim\limits_{x\to-\infty}f(x)$ $\lim\limits_{x\to+\infty}f(x)$

2 $f'(x)$ f

$f'(x)$ f

(C_f)

(C_f) (Δ) 1

3 (C_f) (Δ)

4 $f(x)=2f'(x)-f''(x)+2e^x$ x

f F f $[-1;1]$

III h $h(x)=\dfrac{x^2+1}{e^x}$ (C_h)

1 $h(x)=f(-x)$ x

2 (C_h)

3 $A(\lambda)$ (C_h)

λ $x=\lambda$ $x=0$ $\lim\limits_{\lambda\to+\infty}A(\lambda)$

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05

30%

45% 60%

D E V

1

2

3

04

$$\begin{cases} 2z_1 + iz_2 = 1 + i\sqrt{3} \\ \left(\sqrt{3} + 2i\right)z_1 - z_2 = \left(1 - \sqrt{3}\right)i \end{cases}$$ z_2 z_1 1

B A $(O;u;v)$ 2

$z_B = 2 + \sqrt{3} + i$ $z_A = 1 - i$

. z_B $z_B = z_A\left(1 + \sqrt{3}\right)e^{i\frac{\pi}{3}}$ z_A

$-\frac{\pi}{6}$ O r B D 3

$[BD]$ (γ)

$\arg\left[\left(z - z_B\right)^2\right] = \arg\left(z_B\right) - \arg\left(z_D\right)$ $M(z)$

. $z_C = 1 + i$ C 4

$ACBD$ ABC

-2 O h $S = r$ h S 5

S

$H_n = S$ S ... S H_n $n \geq 2$ $n \in$

n مرة

H_n n

04

(O, i, j, k)

$u(1;-1;1)$ $A(0;2;1)$ (D)

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$B(-1;0;1)$ $v(2;1;-1)$ $BM = tv$ (D')

k $M(k;2-k;1+k)$ (D) M **1**

(D') (D) **2**

(D') M (P) **3**

(P) (D') $H'\left(\frac{1}{3};\frac{2}{3};\frac{1}{3}\right)$

(D) HH' (D) H **4**

(D') (D) **5**

07

$g(x) = e^{3x} + e^{2x} - 5e^{x} - 1$ g **I**

$\lim_{x\to+\infty} g(x)$ $\lim_{x\to-\infty} g(x)$ **1**

g

$g(x)$ $]0,6;0,7[$ α $g(x) = 0$ **2**

(C_f) $f(x) = \frac{e^{2x} - 3e^{x}}{e^{x} + 1}$ f **II**

$\lim_{x\to-\infty} f(x)$ $\lim_{x\to+\infty} f(x)$ $f(x) = \frac{e^{x} - 3}{1 + e^{-x}}$ x **1**

$f'(x) = \frac{e^{x}(e^{x} - 1)(e^{x} + 3)}{(1 + e^{x})^{2}}$ x **2**

f $f'(x)$ x

$f(1)$ 0 (C_f) (T) **3**

$\lim_{x\to+\infty}\left(f(x) - e^{x} + 4\right)$ **4**

(C) (C_f) x $e^{x} - 4$ (C)

(C_f) (T) (C) x e^{x} (C)

$f(x) = e^{x} - 4 + \frac{4e^{-x}}{1 + e^{-x}}$ x **5**

$A = 2(-1 + \ln 4)u.a$ $x = \ln 3$ $x = 0$ (C_f)

m $e^{2x} - (x + m + 3)e^{x} = x + m$ (E) III

$y = x$ (C_f) $f'(\alpha)$ 1

$y = x - 1.4$ α 2

(E) m

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$P(z)=z^3+z^2-4z+6$ z $P(z)$

$\overline{P(z)}=P(\overline{z})$ z 1

$P(z)$ $1+i$ 2

$P(z)=0$ 3

C B A $(O;\vec{u},\vec{v})$

$z_C=\overline{z_B}$ $z_B=1+i$ $z_A=-1$

$z'=(1+i)z+i$ $M'(z')$ $M(z)$ S 1

S

AMM′ A M

z_n A M_n n 2

$M_{n+1}=S(M_n)$ n $M_0=O$

$z_n=(1+i)^n-1$ n

M_n A O n

05

(C) $f(x)=\sqrt{2x+3}$ $\left[-\frac{3}{2};+\infty\right[$ f I

f 1

(Δ) (C) $y=x$ (Δ) (C) 2

$$\begin{cases} u_0=\frac{1}{2} \\ u_{n+1}=\sqrt{2u_n+3} \end{cases}$$ (u_n) II

u_3 u_2 u_1 u_0 1

(u_n)

$2\le u_n<3$ n

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(u_n) (u_n)

$v_n = 3 - u_n$ (v_n) 2

$0 \le v_n \le \left(\frac{2}{3}\right)^n \times \frac{5}{2}$ $n \in$ $v_{n+1} = \frac{2v_n}{3+\sqrt{9-2v_n}}$

(u_n)

10

$h(x) = x(1-2\ln x) + 2\left(x - \sqrt{e}\right)$ $]0;+\infty[$ h **I**

h **1**

$]0;+\infty[$ $h(x)$ **2**

$f(x) = 2x(1-2\ln x)$ $x > 0$ $f(0) = 0$ $[0;+\infty[$ f **II**

$(O;i;j)$ (C_f)

0 f **1**

(C_f) $\lim\limits_{x \xrightarrow{>} 0} \frac{f(x)}{x}$

$\lim\limits_{x \to +\infty} f(x)$

$f'(x) = -2(1+2\ln x)$ $]0;+\infty[$ f **2**

f $f'(x)$ $]0;+\infty[$

O 0 (C_f) (Δ) **3**

(Δ) (C_f)

(C_f) (Δ) **4**

$]0;+\infty[$ f x $x^2(1-\ln x)$ **5**

$[\lambda;\sqrt{e}]$ μ_λ $0 < \lambda < \sqrt{e}$ λ

$\lim\limits_{\lambda \to 0} \mu_\lambda$

(C_g) $g(x) = f(e^{-x})$ g **6**

$g(x)$

$\lim\limits_{x \to +\infty} g(x)$ $\lim\limits_{x \to -\infty} g(x)$

(C_g)

(C_g)

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05

$(O;u;v)$

$\left(\overline{z}+\sqrt{3}+i\right)\left(z^2-2\sqrt{3}z+4\right)=0$ 1

$z_C=\overline{z_B}-2z_A$ $z_B=\sqrt{3}+i$ $z_A=\sqrt{3}-i$ C B A 2

z_B z_A

OAB AB OB OA

$-\frac{\pi}{3}$ O r C D z_D 3

$\left(\frac{z_G}{2\sqrt{3}}\right)^{1945}=\frac{z_G}{2\sqrt{3}}$ $\{(O;-1),(D;1),(B;1)\}$ G 4

G D C G D C B A

AGC $OBGD$

04

$u_{n+1}=f(u_n)$ n $u_0=1$ (u_n)

$f(x)=x-1+\frac{4}{x+1}$ $]-1;+\infty[$ f 1

$y=x$ (Δ) (C)

$(O;i)$ u_3 u_2 u_1 u_0

u_n

$1\le u_n<3$ n 2

(u_n)

$2(3-u_{n+1})\le\frac{3}{2}(3-u_n)$ n 3

$\frac{3-u_n}{2}\le\left(\frac{3}{4}\right)^n$ n

3 u_n

04

(O,i,j,k)

$(x+2y-z+2)^2+(3x+y+2z-1)^2=0$ $M(x,y,z)$ 1

(D)

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$(x+2y-z+2)^2+(3x+y+2z-1)^2=0$ $M(x,y,z)$ 2

(Q) (P)

(P) $(Q)=(D)$

(P_m) m 3

$$(1+3m)x+(2+m)y+(2m-1)z+2-m=0$$

(D) (P_m)

(P_m) (D)

07

$$f(x)=1-\frac{1}{2}x-\frac{2}{e^x+1}$$ f **I**

$(O;i;j)$ (C_f)

f $1-\frac{1}{e^x+1}=\frac{1}{1+e^{-x}}$ x 1

$\lim\limits_{x\to+\infty} f(x)$ 2

$^+$ f $f'(x)=-\frac{1}{2}\left(\frac{e^x-1}{e^x+1}\right)^2$ $x\in$ **3**

$1-\frac{2}{e^x+1}\le\frac{1}{2}x$ x

$\lim\limits_{x\to+\infty}\left[f(x)-\left(1-\frac{1}{2}x\right)\right]$ **4**

(C_f) $y=-\frac{1}{2}x+1$ (Δ) **5**

x $-\frac{1}{e^x+1}$ x $\ln(e^{-x}+1)$ **6**

$x=0$ $x=-1$ y=0 (C_f)

$u_{n+1}=1-\frac{2}{e^{u_n}+1}$ n $u_0=1$ (u_n) **П**

$u_{n+1}\le\frac{1}{2}u_n$ $u_n>0$ n **1**

(u_n) **2**

$2^n.u_n\le 1$ $n\in$ **3**

$\lim\limits_{n\to+\infty} u_n$

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04

$(O;i;j;k)$

1 A B M $MA.MB=0$ $[AB]$

2 A B M $(MA+MB).AB=0$ $[AB]$

3 $[AB]$ (AB) $F(2;1;0)$ $E(0;1;-2)$ $\{(E;1),(F;3)\}$ G

$(0.5;1;1.5)$ $(1.5;1;-0.5)$ $(6;4;-2)$

4 $u(-4;3;2)$ $x-2y+5z-1=0$

5 $A(-3;2;5)$ $B(1;-1;1)$ $C(2;1;2)$ (P) $5x-y-3z-3=0$

(P) (ABC)

04

(u_n) $u_0=3$ $u_{n+1}=2u_n+3n-5$ n

1 u_1 u_2 u_3 $n\geq 3$ $u_n\geq 1$

2 (u_n) $n\geq 4$ $u_n\geq 3n-6$

(v_n) $v_n=u_n+3n-2$

(v_n)

$u_n=2^n+3n+2$ n

3 (w_n) $w_0=2$ $n\in$ $*$ $(n+1)w_{n+1}=(n+2)w_n+1$

w_1 w_2 w_3

w_n n

S_n n $S_n=u_0+u_1+u_2+...+u_n$ $n\in$

05

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$(O;u;v)$

D C B A

$z_D=-2\sqrt{3}+i\left(-2+\sqrt{3}\right)$ $z_C=2\sqrt{3}+i\left(-2-\sqrt{3}\right)$ $z_B=3+4i$ $z_A=1$

D $\frac{2\pi}{3}$ A **r** B

(Γ) D B

$\frac{3}{2}$ B h A F

$z_F=-2i$ F

$[CD]$ F

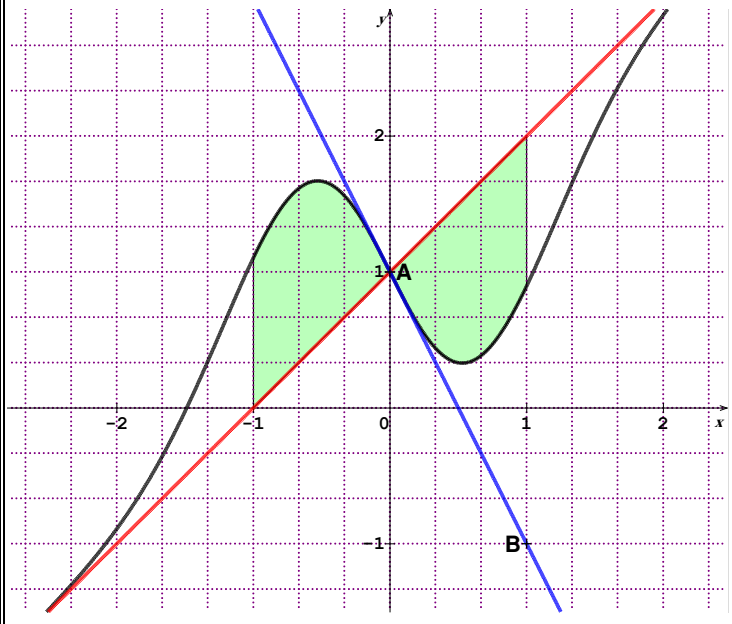
$\frac{z_C-z_F}{z_A-z_F}=-i\sqrt{3}$

F D C B A $[CD]$ (AF)

07

(C) $B(-1;3)$ $A(0;1)$ $(O;i;j)$

$a\in$ $f(x)=x+1+axe^{-x^2}$ f



A (C) 1 I

(AB) 2

x 3

$f'(x)=1-a(2x^2-1)e^{-x^2}$

A (C) (AB) a 4

$a=-3$ II

$\lim_{x\to+\infty}f(x)$ $\lim_{x\to-\infty}f(x)$ 1

$\lim_{|x|\to+\infty}\left[f(x)-x\right]=-1$ 2

$x\in$ 3

$f(-x)+f(x)=2$

(C) A 4

f $\left]\frac{\sqrt{2}}{2};+\infty\right[$ $\left]0;\frac{\sqrt{2}}{2}\right[$ f 5

0,25 α $-2<\alpha<-1$ α $3xe^{-x^2}=x+1$ 6

$x=1$ $x=-1$ $(\Delta):y=x+1$ (C) 7

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04

3 2 2 1 1 0 5 10

3 1 1 1 0

A 1

C B

2

X 2

X

X

05

1 $z^2-2z+2=0$

2 $z_M=-i\sqrt{3}$ $z_L=1-i$ $z_K=1+i$ M L K

4cm $(O;u,v)$

3 $2+i(\sqrt{3}-2)$ L M N z_N

$r(N)=C$ $r(M)=A$ $\frac{\pi}{2}$ O r

C A z_C z_A

$t(N)=B$ $t(M)=D$ $2i$ t

B D z_B z_D

4 AC DB K

ABCD $\frac{z_C-z_K}{z_B-z_K}=i$

04

$n\in$ $u_{n+1}=\frac{7u_n+2}{u_n+8}$ u_0 (u_n)

(u_n) u_0 1

u_2 u_1 $u_0=0$ 2

(u_n) $0\le u_n\le 1$ $n\in$

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$v_n = \dfrac{u_n + 2}{u_n - 1}$ $n \in$ (v_n) 3

(V_n)

$+\infty$ n (u_n) n u_n

$\pi_n = v_0 \times v_1 \times v_2 \times ... \times v_n$ $S = v_0 + v_1 + v_2 + ... + v_n$ π_n S_n

07

(C_f) $f(x) = \dfrac{1}{x(1 - \ln x)}$ x f

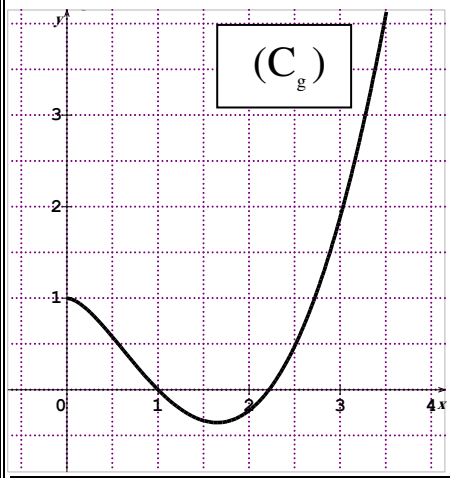
2cm $(O; i; j)$ f

$D_f =]0; e[\cup]e; +\infty[$ f 1 I

$\lim\limits_{x \xrightarrow{>} e} f(x)$ $\lim\limits_{x \xrightarrow{<} e} f(x)$ 2

$+\infty$ (C_f) $\lim\limits_{x \to +\infty} f(x)$

$x(1 - \ln x) = x - x \ln x$ $\lim\limits_{x \xrightarrow{>} 0} f(x)$



$f'(x) = \dfrac{\ln x}{x^2(1 - \ln x)^2}$ D_f x 3

$]0; 1]$ f

$]e; +\infty[$ $[1; e[$

D_f f

$]0; +\infty[$ g II

(C_g) $g(x) = 1 - x^2(1 - \ln x)$

$g(x) = 0$ 1

x	2,1	2,2	2,3	2,4
g(x)	–0,14	–0,02	0,12	0,28

$2,2 < \alpha < 2,3$ α $g(x) = 0$

$f(x) - x = \dfrac{g(x)}{x(1 - \ln x)}$ D_f x 2

α 1 (C_f) $y = x$ (Δ)

$[1; \alpha]$ (C_g) $g(x)$

$[1; \alpha]$ x $f(x) - x \leq 0$

(C_f) (Δ) $(O; i; j)$ 3

$x = 5$ $x = 3$ $y = 0$ (C_f) 4

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04.5

$u_{n+1}=\frac{3}{4}u_n+\frac{1}{6}$ n $u_0=\frac{1}{12}$ (u_n) 1

(u_n) (u_n) $u_n=-\frac{7}{12}\left(\frac{3}{4}\right)^n+\frac{2}{3}$

$(O;u,v)$ 2

O $-\frac{\pi}{4}$ $z'=-\frac{\sqrt{2}}{2}(1-i)z$ T

$y=-x+1$ (Δ) $\arg(z-i)=-\frac{\pi}{4}$ M(z)

$(O;i;j;k)$ 3

A 2;1; 1 (d) $x+y-z+1=0$ (P)

u 1; 1;1

$x-y+z=0$ (P) O (Q)

05

$(z-1+\sqrt{3})(z^2-2z+4)=0...(E)$ z 1

z_2 $\mathrm{Im}(z_2)$ 0 $z_1\in$ (E) z_3 z_2 z_1 2

$z_2^{2020}+z_3^{2020}$ z_3 z_2

$\arg(z_2^n+z_3^n)=(2k+1)\pi$ n

C B A $(O;u;v)$ 3

$z_C=1-\sqrt{3}i$ $z_B=1+\sqrt{3}i$ $z_A=1-\sqrt{3}$

ABC $\frac{z_A-z_C}{z_A-z_B}$

$\{(A,2);(B,1);(C,-1)\}$ G

$2MA^2+MB^2-MC^2=-3$ M

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04

(u_n) $u_0=1$ $u_1=1$ $\in n$ $u_{n+2}=\frac{2}{3}u_{n+1}-\frac{1}{9}u_n$

1 (v_n) $v_n=\frac{u_n}{2n+1}$

v_0 v_1 v_2 u_2 u_3

(v_n) $\frac{1}{3}$

n v_n $u_n=(2n+1)e^{-n\ln 3}$ n

2 n $u_n>0$

(u_n)

3 n $S_n=\frac{u_0}{v_0}+\frac{u_1}{v_1}+\frac{u_2}{v_2}+\ldots+\frac{u_n}{v_n}$

07

f $f(x)=1+(x+3)e^{-\frac{x}{2}}$ $(\mathcal{C}_f)$

1 $\lim\limits_{x\to+\infty} f(x)$ $\lim\limits_{x\to+\infty} f(x)-1=0$

$(\mathcal{C}_f)$ (Δ) $y=1$

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

3 $(\mathcal{C}_f)$

4 (T) $(\mathcal{C}_f)$ $y=1-(x-5)e^{-\frac{1}{2}}$ 1

$f(x)=0$ α $-3,21<\alpha<-3,19$

5 (T) (Δ) $(\mathcal{C}_f)$ $[-4;+\infty[$

6 m $f(x)=f(m)$

7 $\int_{\alpha}^{0}(x+3)e^{-\frac{x}{2}}dx=(2\alpha+10)e^{-\frac{\alpha}{2}}-10$

α $A(\alpha)$ $(\mathcal{C}_f)$ (Δ)

$x=\alpha$ $x=0$

$A(\alpha)=-4\left(\frac{3\alpha+10}{\alpha+3}\right)u.a$

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05

$(O;u;v)$

$z_A = 4\sqrt{3} - 4i$ $z_B = 4\sqrt{3} + 4i$ A B 2

OAB $\frac{z_B}{z_A}$

O R D $z_C = -\sqrt{3} + i$ C $-\frac{\pi}{3}$

D z_D

G 3 $\{(O;-1),(D;1),(B;1)\}$

G z_G

G D C B A

M $\|MB + MD - MO\| = \|MB - MG\|$

G D C $\frac{z_G - z_C}{z_D - z_C}$

G D H

M z $\frac{z_G - z}{z_D - z}$

F ACGF

04

n 2 1 1 1

$n > 1$ 2

1

2

X 3

X X

$$E(X) = \frac{4n^2 + 22n + 30}{(n+3)(n+4)}$$

n $E(X) = \frac{1347}{337}$

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04

$(0;i,j,k)$

$C(1;-1;2)$ $B(1;1;4)$ $A(0;-1;1)$

1 ACB $CA.CB$

$\sqrt{3}$ u.a ABC

2 (ABC) $n(1;a;b)$ b a

(ABC)

3 (ABC) A (Δ)

$\Omega(-1;-2;2)$ ΩA

ΩABC

4 2 Ω (S) $(S)\cap(ABC)$

07

I g $g(x)=x^2+1-2\ln x$ $]0;+\infty[$

1 g

2 $g(x)$ $]0;+\infty[$

II f $f(x)=x+\frac{1}{x}(1+2\ln x)$ $]0;+\infty[$

f (C_f) $(O;i,j)$

1 $\lim\limits_{x\to+\infty} f(x)$ $\lim\limits_{x\xrightarrow{>}0} f(x)$

f f' $f'(x)=\frac{g(x)}{x^2}$ $]0;+\infty[$

f

2 (C_f) $+\infty$ $y=x$ (Δ)

(C_f) (Δ)

$f(x)=0$ α $0.5<\alpha<0.6$

3 (C_f) $A(x;2)$ $x\geq 1$ (T)

(C_f) $B(e;e+\frac{3}{e})$ $x^2g'(x)-2xg(x)=0$

(C_f) (T) (Δ)

4 f F $]0;+\infty[$ x $(\ln x)^2$

$y=0$ $x=1$ $x=\alpha$ (C_f)

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05

I A V N R

1

2 $\frac{7}{18}$

II B V N

B

A

1

2 $\frac{4}{9}$

3

4 X

5

α

α

04

1. (u_n) $u_0=0$ $u_1=1$ $3u_{n+2}=5u_{n+1}-2u_n$ $n\in$

(v_n) $v_n=u_{n+1}-u_n$

(v_n) u_2 u_3

(v_n) $\frac{2}{3}$

n v_n (u_n)

3 (u_n) $0\le u_n\le 3$ n

4 S_n n $S_n=v_0+v_1+v_2+\ldots+v_{n-1}$

(u_n) $3^{n-1}(3-u_n)=2^n$ n

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04

F D C B A $(O;u,v)$ 1

$z_F=\overline{z_D}$ $z_D=-2+2\sqrt{3}i$ $z_C=-2$ $z_B=\overline{z_A}$ $2z_A=-1+\sqrt{3}i$

ABC F D C B A z_B z_A

$z'+2=e^{-i\frac{\pi}{3}}(z+2)$ $M'(z')$ $M(z)$ $\Re$ 2

$\Re(D)=E$ $z_E=1+\sqrt{3}i$ $\Re$

(EF) (ED) $\frac{z_F-z_E}{z_D-z_E}$

$z'=\frac{z-z_C}{z-z_E}$ z' E z 3

(Γ_1) z' z M (Γ_1)

.G z_G $\{(A,|z_A|);(B,|z_B|);(C,|z_C|)\}$ G 4

$\|MA+MB+2MC\|=\|MA+MB-2MC\|$ M (Γ_2)

$.(\Gamma_2)$ (Γ_2) C

07

$f(x)=\frac{x}{x-1}-\ln|x-1|$ $-\{1\}$ f

$(O;i;j)$ f (C_f)

$\lim_{x\to+\infty} f(x)$ $\lim_{x\to-\infty} f(x)$ 1

$\lim_{x\to 1} f(x)$ $\lim_{x\to 1} f(x)$

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

f

$\alpha\in]4;5[$ $f(x)=0$ 3

ω (C_f)

2 (Δ') (Δ) (C_f)

(C_f) (Δ') (Δ) $f(-8)$ $f(-4)$ $f(-1)$ $f(10)$ $f(6)$

m

$m(x-1)=2x^2-x-(x-1)\ln|x-1|$

$g(x)=e^{-x}\ln(e^x-1)$ $]0;+\infty[$ g 4

g $g'(x)=e^{-x}f(e^x)$ x

g $\lim_{x\to+\infty} g(x)=0$ $\lim_{x\to 0} g(x)$

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05

$.(O;i;j;k)$

$C(2;-2;0)$ $B(2;1;3)$ $A(1;2;3)$

1 C B A

2 $.(ABC)$ $x+y-z=0$

3 $.(DE)$ $E(-4;6;2)$ $D(2;0;2)$

4 $x(x-2)-y(2-y)+z(z-8)+14=0$ $M(x;y;z)$ (S)

R Ω (S)

H (S) (DE)

(S) (ABC)

04

- I $(z+2)(z^2+2-2\sqrt{3}i)=0$

II C B A $(O;u;v)$

$z_C=-z_B$ $z_B=-1-i\sqrt{3}$ $z_A=-2$

1 ABC $|z_A-z_B|^2+|z_A-z_C|^2=|z_B-z_C|^2$

2 C B A

3 O A D z_D

ABDC

4 A B C

5 $z'=\dfrac{iz-\sqrt{3}+i}{z+2}$ $M'(z')$ $z\neq -2$ $M(z)$

$\arg(z')=\dfrac{\pi}{2}+(AM;BM)$

z' M

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04

$(U_n)_{n\in}$ $U_0=1$ $\ln U_1+\ln U_2=-3\pi$

U_n n

$P_{n+1}=U_0+U_1+.....+U_n$ n P_{n+1} $\lim\limits_{n\to+\infty}(P_{n+1})$

$V_n=\ln(U_n)$ $(V_n)_{n\in}$ 2

$(V_n)_{n\in}$

$S_{n+1}=V_0+V_1+.....+V_n$ n S_{n+1} $\sin(S_{n+1})=0$

$\pi_{n+1}=U_0\times U_1\times.....\times U_n$ n π_{n+1} 3

$\pi_{p+1}=e^{-6\pi}$ U_p

07

$g(x)=\dfrac{x}{x+1}-\ln(x+1)$ $]-1;+\infty[$ g (I

g 1

. $]-1;+\infty[$ $g(x)$ 2

$x\in]-1;0[\ ]0;+\infty[$ $f(x)=\dfrac{\ln(x+1)}{x}$ $f(0)=1$ $]-1;+\infty[$ f (II

$(O;i;j)$ (C_f)

. $\lim\limits_{x\to+\infty}f(x)$ $\lim\limits_{x\xrightarrow{>}-1}f(x)$ 1

0 f $]-1;+\infty[$ f

$f'(0)=-\dfrac{1}{2}$ (C_f) (T)

$h(x)=f(x)+\dfrac{1}{2}x-1$ $]-1;+\infty[$ h 2

$k(x)=x^2(f'(x)+\dfrac{1}{2})$ $k(x)$ $]-1;+\infty[$ $h'(x)$

k $k'(x)=\dfrac{x^2(x+2)}{(x+1)^2}$ $x\in]-1;+\infty[$

.(T) (C_f) $h(x)$ $h'(x)$

. (T) (C_f) 4

$f(x)=(\ln m)(x-2)$ $x>-1$ x m 5

. (E) m

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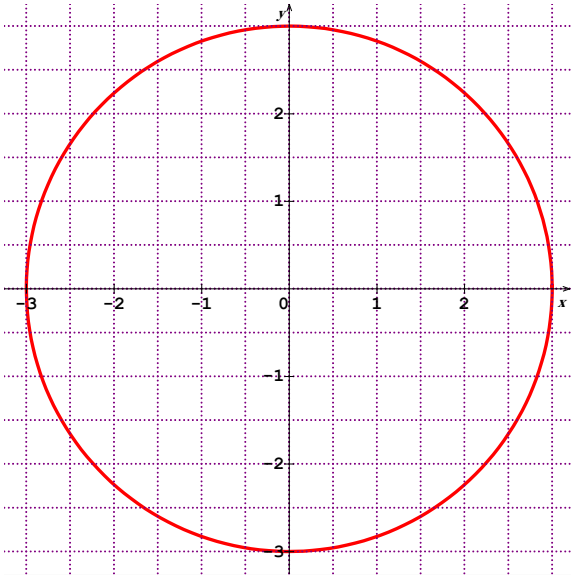
05

$z^2-(\sqrt{5}+2i)z+1+4i\sqrt{5}=0...(E)$ 1

$\Delta=-3(\sqrt{5}+2i)^2$ (E) $(\sqrt{5}+2i)^2$

$b=(\sqrt{5}+2i)(\frac{1-i\sqrt{3}}{2})$ $a=(\sqrt{5}+2i)(\frac{1+i\sqrt{3}}{2})$ (E)

$(O;u;v)$ 2



3 O (C)

$\sqrt{5}+2i$ Q

Q (C)

b a B A 3

(C) B A

. $OA+OB=OQ$

OAQB

B A

05

1 0 1 1 1

I 3 1 0 0 1 1

0 B A

C

$P(\overline{A\cup B})$ $P(A\cap B)=\frac{31}{120}$ $P(B)=\frac{31}{120}$ $P(A)$ 1

2

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X II

X 1

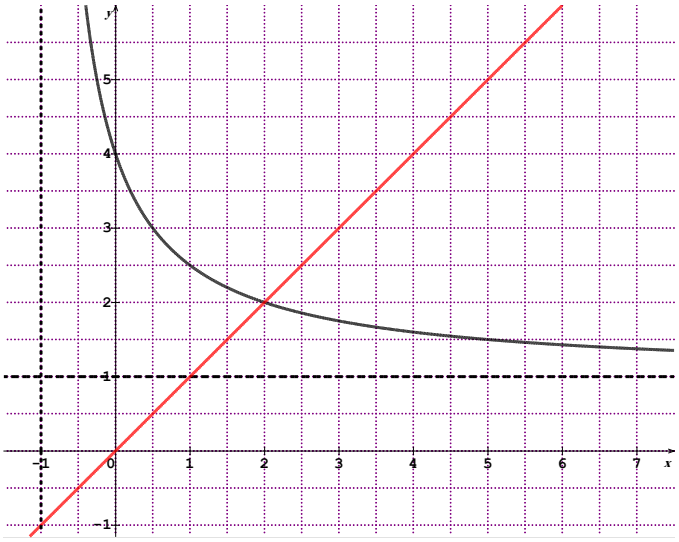
$P(X^2-1=0)$ 2

04

$\begin{cases} u_0=1 \\ u_{n+1}=f(u_n) \end{cases}$ (u_n) $f(x)=\dfrac{x+4}{x+1}$ $]-1;+\infty[$ f

$y=x$ (D) $[0;+\infty[$ f (C) 1

u_2 u_1 u_0



(u_n)

$1\le u_n\le\dfrac{5}{2}$ $n\in$

$v_n=\dfrac{6-3u_n}{u_n+2}$ (v_n) 2

(v_n) $u_{n+1}+2$ $6-3u_{n+1}$

$-\dfrac{1}{3}$

(u_n) v_n u_n

07

(C_f) $f(x)=(ax^2+bx+c)e^x$ $\mathbb{R}$ f

1 (C_f) c b a I

A $A(2;-e^2)$ (C_f)

$\mathbb{R}$ $f(x)=(2x^2-7x+5)e^x$ II

$\lim\limits_{x\to-\infty} f(x)=0$ 1

f $f'(x)$

0 (C_f) (d)

(d) (C_f) 2

$\mathbb{R}$ f $f(x)=4e^x+2f'(x)-f''(x)$ $x\in$ 3

$y=0$ $x=1$ $x=0$ (C_f) 4

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04

$(O;u;v)$.

$(2\bar{z}-1+9i)(z^2-8z+32)=0$ 1

$z_\Omega = i$ $z_C = \frac{1}{2}+\frac{9}{2}i$ $z_B = \bar{z}_A$ $z_A = 4+4i$ Ω C B A 2

$\arg(\bar{z}-4+4i)^2 = \frac{\pi}{2}+2\pi k \quad / \quad k \in$ $M(z)$ (Γ)

$z' = \frac{1}{2}(1+i)z+\frac{1}{2}+\frac{1}{2}i$ $M'(z')$ $M(z)$ S 3

$S(A)=C$ S

S (Γ) (Γ')

$A_{n+1} = S(A_n)$ $n \in$ $A = A_0$ A_n A_1 A_0 A_n z_n 4

$z_n - i = \left(\frac{\sqrt{2}}{2}\right)^n e^{i\frac{n\pi}{4}}(z_0 - i)$ n

A_2 A_{n+1} $\Omega A_n A_{n+1}$

04

$(0,i;j;k)$

$E(0;4;4)$ $C(-1;7;6)$ $B(3;2;5)$ $A(2;1;3)$

AC AB **1**

$AE = \alpha AB + \beta AC$ β α

C B A E

$\frac{9\sqrt{3}}{2}ua$ ABC $\cos(BAC)$ AB.AC **2**

(ABC) $D(-1;3;5)$ E **3**

ABCD

(AC) E [AC] E' **4**

$x-2y-z+12=0$ (DEE')

05

$(z+\sqrt{3}-3i)(z^2-6z+12)=0$ 1

C B A $(O;u,v)$ 2

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$z_C = -\sqrt{3}+3i \quad z_B = 3-i\sqrt{3} \quad z_A = 3+i\sqrt{3}$

OAC $\frac{z_C}{z_A}$ z_C z_A

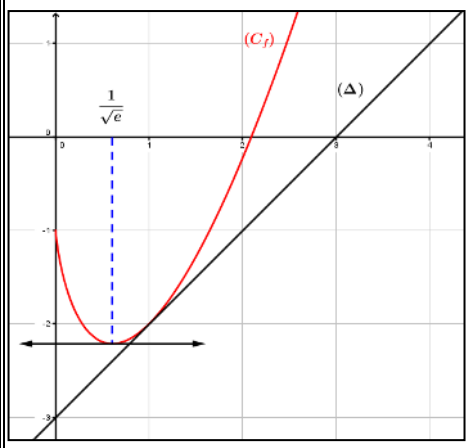
$\left(\frac{z_A}{2\sqrt{3}}\right)^{1441}+\left(\frac{z_B}{2\sqrt{3}}\right)^{2020}$

(BC) (AD) C D 3

C A $E\left(3-\sqrt{3},0\right)$ S 4

C O E A 5

07



$(O;i;j)$

$g(x)=2x\ln x-x-1 \quad]0;+\infty[$ g **I**

(C)

(C) -

1 (C) (Δ) $\frac{1}{\sqrt{e}}$

1

g (Δ) $g'(1)$ $g(1)$ $g'\left(\frac{1}{\sqrt{e}}\right)$

$g(x)$ $g(\alpha)=0 \quad 2<\alpha<2,1$ α 2

$\begin{cases} f(x)=x^2(\ln x-1)-x \ ;x>0 \\ f(0)=0 \end{cases}$ $]0;+\infty[$ f **II**

$(O;i;j)$ (C_f)

f $\lim\limits_{x \xrightarrow{>} 0}\frac{f(x)}{x}=-1$ 1

O (C_f) (T)

f $\lim\limits_{x\to+\infty} f(x)$ $f'(x)=g(x) \quad x\in]0;+\infty[$ 2

$f(\alpha)$ $2f(\alpha)=-(\alpha^2+\alpha)$ 3

(C_f) $y=-x$ (Δ') (Δ') 4

$f(3,55)$ 0 (C_f) (Δ')

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04

$z' = 2iz + 4 + 2i$ $M'(z')$ $M(z)$ T **1**

M AMM′ A(0;2) A $\theta = \frac{\pi}{2}$ $k = 2$ T

4 3 **2**

3

$\frac{4}{63}$ $\frac{5}{84}$ $\frac{2}{7}$ $\frac{11}{81}$ 3

$u_{n+1} = \frac{2}{5}u_n + \frac{6}{5}$ n $u_0 = 7$ (u_n) **3**

(u_n) $u_n = 2\left[\left(\frac{2}{5}\right)^{n-1} + 1\right]$

05

B(1; 3; 5) A(−2; −1; 3) (O; i, j, k)

$t \in$ $\begin{cases} x = 1 + t \\ y = -2t \\ z = 3 - 6t \end{cases}$ (Δ) D(2; −2; −3) C(2; −0,5; −4)

(AB) (Δ) (AB) 1

(AB) (Δ) (P) 2

(P) n(2; −2; 1)

M (P) (Δ) M

(P) C (Δ) D 3

ABCD A ABC

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04

$\ln U_2 - \ln U_4 = 4 \quad \ln U_1 + \ln U_5 = -12$ (Un 1

n Un U0

$S_n = U_0 + U_1 + ... + U_n$

$+\infty$ n Sn n Sn

$V_n = \ln U_n + \ln U_{n-1}$ n (Vn 2

(Vn

$T_n = V_0 + V_1 + ... + V_n$

$T_n^2 = 2^{2020}$ n

07.5

$2cm$ $(O;i;j)$

(C_g) $g(x) = \frac{3e^x - 1}{e^x + 1}$ g **I**

g 1

$g(x) + g(-x) = 2$ $x \in$ 2

g(x) $g(-\ln 3)$ 3

(C_g) 4

(C_g) $y = x + \alpha$ α 5

(C_g) 6

$g(x) = a + \frac{be^{-x}}{e^{-x} + 1}$ b a 7

$x = 0 \quad x = -3 \quad y = 0$ (C_g) 8

(C_f) $f(x) = -x + 4\ln(e^x + 1)$ f **II**

$\lim_{x \to +\infty} f(x) = +\infty$ $-\infty$ f 1

$\lim_{x \to -\infty} \left(f(x) + x\right) = 0$

(C_f) (C_f) $\lim_{x \to +\infty} \left(f(x) - 3x\right) = 0$

$f'(x) = g(x)$ x 2

f $f'(x)$

(C_f) 3

x m 4

$4\ln(e^x + 1) = x + m$

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04

$f(x)=\dfrac{-3}{x-4}$ $[1;3]$ f

$f(x)\in[1;3]$ $x\in[1;3]$ f 1

n $\begin{cases}u_0=2\\u_{n+1}=f(u_n)\end{cases}$ (u_n) 2

n $1<u_n<3$

(u_n) N (u_n)

$v_n=\dfrac{u_n-1}{u_n-3}$ N (v_n) 3

(v_n)

$S_n=v_0+v_1+.....+v_n$ n v_n

$3+2S_n=\dfrac{1}{27}$ n

04

5 3 U_1 3

U_3 U_2

( ) 3

(1

U_2 (2

(3

α α

5DA 10DA

α X

α X

05

$(z-1+i)\left[z^2-2(2+\sqrt{3})z+8+4\sqrt{3}\right]=0$

C B A $(O;i;j)$ 2

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$z_C = 2+\sqrt{3}-i \quad z_B = 2+\sqrt{3}+i \quad z_A = 1-i$

C B A B $z_B - 2 = 2e^{i\frac{\pi}{6}}$

$-\frac{\pi}{6}$ O r B B' $z_{B'}$

z_B $\frac{z_B}{z_{B'}}$

$\theta \in$ $a \in {}^{*}_{+}$ $z = ae^{i\theta}$ M **3**

M_1 M' r M M_1

$ae^{i(\frac{\pi}{6}-\theta)}$ M' z'

$M = M'$ M $z' = z$ θ

07

$g(x) = -2\ln(x+1) + \frac{x}{x+1}$ $]-1;+\infty[$ g

g 1

g $g'(x)$

$]-0,72;-0,71[$ α 0 $g(x) = 0$ 2

$]-1;+\infty[$ g(x)

$f(0) = 0$ $\begin{cases} f(x) = \dfrac{x^2}{\ln(x+1)}; x > -1; x \neq 0 \\ f(x) = (1+x)e^{-x-1}; x \leq -1 \end{cases}$ f

$(O; i; j)$ f (C_f)

f 1

1 f 2

$f'(x) = \dfrac{-x.g(x)}{\ln^2(x+1)}$ $]-1;+\infty[- \{0\}$ x 3

$]-\infty;-1[$ $f'(x)$

f

0 (C_f) (T) 4

1 (T)

$f(-2;5)$ $-6;7$ $f(3)$ $6;5$ $f(\alpha)$ $-0;41$ (C_f)

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