2019 2018

02

2008

5

$\mathbb{R}$ P

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

$\mathbb{R}$ P 1

α $P(x) = 0$ 2

$$\left]-\tfrac{1}{2}; 0\right[$$

$\mathbb{R}$ $P(x)$ 3

$\mathbb{R}$ G 4

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

$\mathbb{R}$ G

$G(\alpha)$

3 2009

$P(x)$

$$P(x) = 2x^2 - 5x + 2$$

$P(x) = 0$ $\mathbb{R}$ 1

$]0; +\infty[$

$$2(\ln x)^2 - 5\ln x + 2 > 0$$

$2^{2x+1} = 5 \times 2^x - 2$ $\mathbb{R}$ 2

8

f

x	$-\infty$		$\frac{1}{2}$		1		$\frac{3}{2}$		$+\infty$
$f'(x)$		$+$	0	$-$		$-$	0	$+$	
$f(x)$	$-\infty$	↗	1	↘	$-\infty$ / $+\infty$	↘	3	↗	$+\infty$

$f(x) = ax + b + \frac{c}{x-1}$ $f(x)$

c , b , a

$f'(x)$ 1

f 2

c , b , a

$\lim\limits_{x \to 1^>} f(x)$ $\lim\limits_{x \to 1^<} f(x)$

f $\frac{3}{4}$ $\frac{1}{2}$

$a = 1$ $b = 1$ $c = \frac{1}{4}$ 3

f (C)

$(-\infty)$ $(+\infty)$ x

$y = x + 1$ (Δ) (C)

(Δ) (C)

(C) $\omega(1; 2)$

(C)

λ λ 4

$$f(x) = |\lambda|$$

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9

$\mathbb{R}-\{-1\}$ f

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

f (C_f)

$(O;\vec{i};\vec{j})$

I

1 $c\,,b\,,a$

$f(x)=ax+b+\frac{c}{x+1}$ $\mathbb{R}-\{-1\}$ x

2 f

3 (C_f)

4 $y=x-1$ (Δ)

5 (C_f) (Δ) (C_f)

II

1 $\mathbb{R}-\{-1\}$ x

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

2 f

3 (C_f) (D)

0

III

1 (C_f) $A(-1;-2)$

2 (C_f) (D) (Δ)

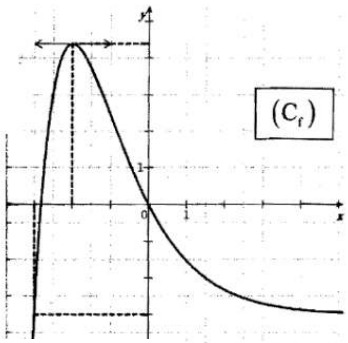
3 m

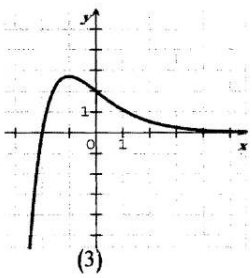
$f(x)=m$

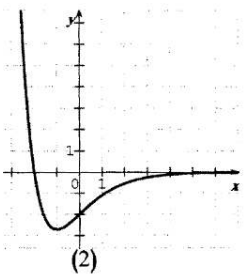
4 (C_f)

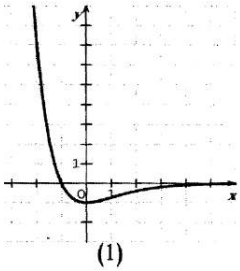
(Δ)

$x=e^2-1$ $x=1$









3

(C_f) $]-\infty;-1[\cup]-1;+\infty[$ f

x	$-\infty$		-1		$+\infty$
$f(x)$	2	↗	$+\infty$ | $+\infty$	↘	2

(C_f) $y=2$ 1

$f(x)=0$ 2

$f(x)>0$ 3

$S=\ ]-\infty;-1[\cup]-1;+\infty[$

$]-\infty;-1[$ 4

$x<-2$ $f(-2)>f(x)$

(C_f) $A(-3;1)$ 5

f 6

8

$f(x)=(x+a)e^{-x}+b$ $\mathbb{R}$ f

(C_f) b a

$(O;\vec{i};\vec{j})$

(C_f) 1

$f'(-2)$ $f(0)$ $f(-3)$

$f'(x)$ x

(3) (2) (1)

f f'

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

f

(C_f)

$[0;+\infty[$ $f(x)=-2$

1,52 1,50 α

$\mathbb{R}$ f 3

I $f(x)=(-x-4)e^{-x}$

$$I=\int_{-2}^{0} f(x)\,dx$$

$\mathbb{R}$ f $f'(x)$

I

$4{,}5<I<5$

I

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$f(x) = \frac{x^3-5x^2+4}{x^2}$ $\mathbb{R}^*$ f

(C_f)

$(O;\vec{i};\vec{j})$

1 $\mathbb{R}^*$ x

a $f(x) = x - 5 + \frac{a}{x^2}$

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

3 $\mathbb{R}^*$ x

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

f

4 (C_f)

5 (C_f) (Δ)

1

6 (C_f) (Δ)

7 f F

$F(2) = -10$ $]0;+\infty[$

(C_f)

$x = 2$ $x = 1$

4

$]0;+\infty[$ f

$f(x) = (\ln(x))^2 + 2\ln(x) - 3$

ln (C_f)

1 $f(x) = 0$ $]0;+\infty[$

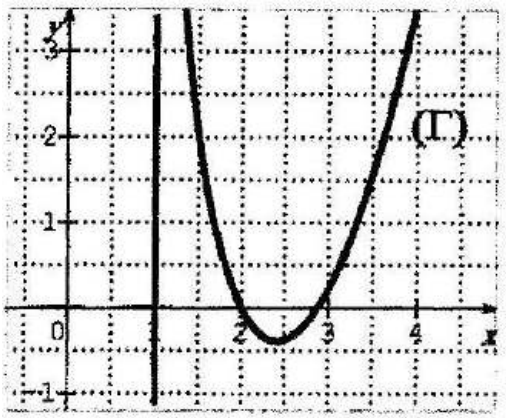
$f(x)$

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

2 f $f'(x)$

3 (C_f)

9



$]1;+\infty[$ x 2

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

f

3 $f(\alpha) = 3{,}9$ (C_f) (Δ)

4 $x \mapsto [\ln(x-1)]^2$

$]1;+\infty[$ f

$\int_2^5 f(x)\,dx$

I $]1;+\infty[$ g

$g(x) = x^2 - 2x - 4\ln(x-1)$

(Γ) ln

1 $g(x) = 0$

2 $g(2)$

3 α $g(x) = 0$

$2{,}87 < \alpha < 2{,}88$

4 $]1;+\infty[$ $g(x)$ x

II $]1;+\infty[$ f

$f(x) = x - 3 + 4\frac{\ln(x-1)}{x-1} + \frac{5}{x-1}$

(C_f)

$(O;\vec{i};\vec{j})$

1 $\lim_{x\to+\infty} \frac{\ln x}{x} = 0$ $+\infty$ f

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

$y = x - 3$ (Δ)

$+\infty$ (C_f)

(C_f) (Δ)

(C_f)

(Δ)

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$\mathbb{R}$ f 1

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

$-\infty$ $+\infty$ f

$$\lim_{x\to+\infty} \frac{x}{e^{2x}} = 0$$

$\mathbb{R}$ f

$f'(x) = (e^x - 1)(2e^x + 1)$ f'

$f'(x)$ x

f

f (C) 2

$]-\infty; 1]$ $(O; \vec{\imath}; \vec{\jmath})$

$y = -x - 2$ (d)

$-\infty$ (C)

(d) (C)

β α $f(x) = 0$

$0{,}81 < \beta < 0{,}82$ $-2{,}11 < \alpha < -2{,}10$

(C) (d)

$]-\infty; 1]$ f F 3

3

$\ln(-3x + 2) \leq \ln 3$ 1

$\mathbb{R}$. $\left[-\frac{1}{3}; +\infty\right[$. $\left[-\frac{1}{3}; \frac{2}{3}\right[$.

$]0; +\infty[$ f 2

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

$x = e$

$F(x) = -1 + \ln x$. $F(x) = e^{-2} - \frac{1}{x^2}$.

$F(x) = \ln x$.

$[-2; 2]$ $g : x \mapsto \frac{x^2}{4}$ 3

$\frac{1}{3}$. 3 . $\frac{4}{3}$.

7

f $f'(x)$ 4

x 5

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

(C)

(C) (Δ) 6

$$\int_0^1 \frac{x}{x^2+1}\, dx$$ 7

(C)

$x = 1$ $x = 0$

$\mathbb{R}$ f

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

f (C)

$(O; \vec{\imath}; \vec{\jmath})$

$4cm$ $1cm$

x 1

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

$+\infty$ $-\infty$ f 2

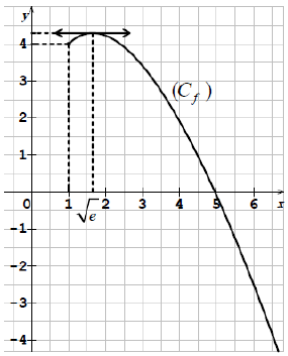
(C)

(Δ) (C) 3

$y = 1$

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f (C_f)

$f(x) = ax + b + cx\ln x$ $[1;+\infty[$

c b ، a

$+\infty$ f f 1

f' $f'(x)$ c a 2

$[1;+\infty[$ f

$f(5) = 16 - 10\ln 5$

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

1

f

α $f(x) = 0$ 3

$4{,}95 < \alpha < 4{,}96$ $[1;+\infty[$

$S = \int_1^{\alpha} f(x)\,dx$ S 4

$f(x) = 0$ α

$g : x \mapsto 2x^2 + x - x^2\ln x$

$[1;+\infty[$ f

α S

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

5

$]-1;+\infty[$ f

$$f(x) = \frac{1}{3}x^3 + 100 + \frac{57600}{x+1}$$

$+\infty$ -1 f 1

$]-1;+\infty[$ x 2

$$f'(x) = \frac{(x^2+x-240)(x^2+x+240)}{(x+1)^2}$$

$]-1;+\infty[$ f

$h: x \mapsto \frac{1}{x+1}$ H

$x = 0$ $]-1;+\infty[$

3

200 5

x C_m

f $[5;200]$

$C_m(x) = f(x)$ $[5;200]$ x

x $C(x)$

$C'(x) = C_m(x)$

$C(x)$

40 000 DA 5

15

6

$[-1;+\infty[$ f

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

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

(C_f)

$(O;\vec{i};\vec{j})$

(C_f) (Δ) 1

$y = -x + 3$ 1

$[-1;+\infty[$ g 2

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

g

$g(x)$ $g(1)$

$[-1;+\infty[$

$[-1;+\infty[$ h 3

$h(x) = (x+1)e^{1-x} + x - 3$

$[-1;+\infty[$ x

$h'(x) = f(x) + x - 3$

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

$[-1;+\infty[$ x

h $h'(x) = g(x)$

$h(x) = 0$

$[-1;+\infty[$

(C_f) $h(x)$

(Δ)

(C_f) (Δ)

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7

$]0;+\infty[$ g I

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

$g(x)$ x 1

$]0;+\infty[$ x 2

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

$]0;+\infty[$ g

$]0;8]$ f II

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

(C_f)

$(O;\vec{\imath};\vec{\jmath})$

g f 1

1 $]0;8]$

$]0;8]$ f

$\lim\limits_{x\to 0^{>}} f(x)$

f

α $f(x)=0$ 2

$3{,}8<\alpha<3{,}9$

(C_f) 3

$\left]-\frac{2}{3};2\right]$ h III

$$h(x)=f(3x+2)$$

$0<3x+2\leq 2$ $-\frac{2}{3}<x\leq 0$ 1

$2\leq 3x+2\leq 8$ $0\leq x\leq 2$

$h(x)$ $h'(x)$ 2

h 3

7

$\mathbb{R}^*$ f

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

(C_f)

$(O;\vec{\imath};\vec{\jmath})$

$\lim\limits_{x\to 0^{>}} f(x)$ $\lim\limits_{x\to 0^{<}} f(x)$ 1

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

$y=2x-1$ (Δ) 2

(C_f)

x

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

(C_f) $y=2x-2$ (Δ')

x 3

$$f'(x)=\frac{2e^{2x}-5e^x+2}{(e^x-1)^2}$$

f

(C_f) (Δ') (Δ) 4

$\int_1^2 f(x)\,dx$ 5

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4

x 1

$$(2x+1)(x^2-5x+6)=2x^3-9x^2+7x+6$$

$\mathbb{R}$

$$2(\ln x)^3-9(\ln x)^2+7\ln x+6=0$$

$$6e^{-3x}+7e^{-2x}-9e^{-x}+2=0$$

$\mathbb{R}$

$$2e^{3x}-9e^{2x}+7e^{x}+6\leq 0$$

$\mathbb{R}$ 2

$$\log(x^2+100)=1+\log 2+\log x$$

7

$]0;+\infty[$ g I

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

g 1

$g(x)$ x $g(1)$ 2

$]0;+\infty[$ f II

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

(C_f)

$(O;\vec{\imath};\vec{\jmath})$

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

$\lim\limits_{\substack{x\to 0\\ >}}f(x)$

$]0;+\infty[$ x 2

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

f

$y=x-1$ (D) 3

(C_f)

(D) (C_f)

(C_f) A 4

(T) (D) (T)

(C_f) (T) (D) 5

$[1;3]$ f 6

7

x C_M II

f $[0;7]$ x

$C_M(x)=f(x)$

1

10^{-2}

2

3,5

3

C_T

$k\in\mathbb{R}$ $C_T(x)=(12x+6)e^{-x}+5x+k$

k

$C_T(0)=2$ 2

$]0;+\infty[$ f

$$f(x)=6(1-2x)e^{-x}+5$$

(C_f)

$(O;\vec{\imath};\vec{\jmath})$

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

$\lim\limits_{x\to+\infty}xe^{-x}=0$

f 2

(C_f) 3

$[0;7]$ $f(x)=3,5$ 4

β α

$2,9<\beta<3$ $0,7<\alpha<0,8$

$f(x)\leq 3,5$ $[0;7]$

b a 5

$g(x)=(ax+b)e^{-x}$ $[0;7]$ g

$[0;7]$ h

$h(x)=6(1-2x)e^{-x}$

$[0;7]$ f

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9

$(O;\vec{i};\vec{j})$

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

$$f(x)=ax+b+3\ln(x+1)$$

b a

f (Γ)

$A(2;-1+3\ln 3)$

1

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

f

b a 2

II

$$f(x)=-x+1+3\ln(x+1)$$

-1 f 1

$\lim\limits_{x\to+\infty}\frac{\ln(x+1)}{x}=0$ $+\infty$ f 2

(Γ) B 3

(Γ) (T)

(T) $y=x$

m

$f(x)=x+m$

$]-1;+\infty[$ g 4

$$g(x)=(x+1)\ln(x+1)-x$$

f $g'(x)$

$]-1;+\infty[$

(Γ) β α

$\beta\in]-0{,}37\ ;-0{,}36[$ $\alpha\in]7{,}37\ ;7{,}38[$

S

(Γ)

$x=\alpha$ $x=0$

$$S=\left(\frac{1}{2}\alpha^2-2\alpha-1\right)ua$$

ua S

7

III

1000 C_m

f $[0;7]$

$C_m(x)=f(x)$ $x\in[0;7]$ (II

x $C_T(x)$

$C_T(x)$ 1

$\frac{5}{2}$

7 2

9

$$f(x)=\frac{4e^{-x}}{e^{-x}+1}-3$$ $\mathbb{R}$ f

(C_f)

$(O;\vec{i};\vec{j})$

x 1

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

$+\infty$ $-\infty$ f

f 2

(C_f) 3

(C_f) (T)

$\Omega(0;-1)$

x

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

(C_f) (T)

(C_f) 4

$y=0$ $x=-\ln 3$ $x=0$

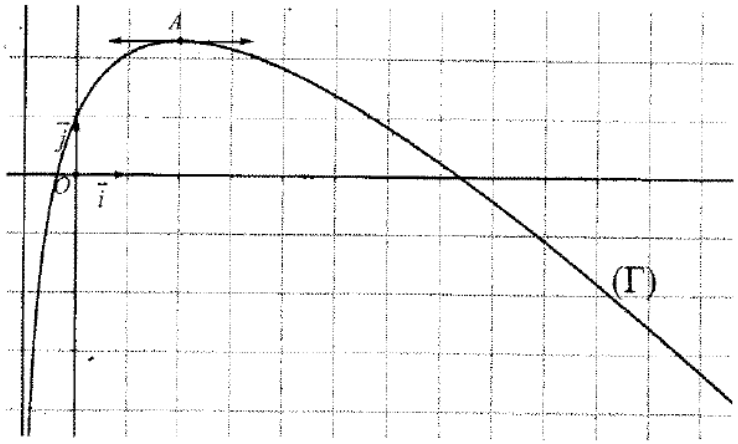
$h(x)=f(|x|)$ $\mathbb{R}$ h 5

$(O;\vec{i};\vec{j})$ (C_h)

h

(C_f)

(C_h)



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7.5

$]0;+\infty[$ g I

b a $g(x)=ax+b+\ln x$

$g'(2)=\frac{3}{2}$ $g(1)=2$ b a 1

$g(x)=x+1+\ln x$ 2

$\lim\limits_{x\to+\infty} g(x)$ $\lim\limits_{\substack{x\to 0\\ >}} g(x)$

g

α $g(x)=0$

$0{,}2<\alpha<0{,}3$

$g(x)$ x

$]0;+\infty[$

$]0;+\infty[$ f II

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

(C_f)

$(O;\vec{i};\vec{j})$

$]0;+\infty[$ x 1

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

$\lim\limits_{x\to+\infty} f(x)$ $\lim\limits_{\substack{x\to 0\\ >}} f(x)$ 2

$\lim\limits_{\substack{x\to 0\\ >}} x\ln x=0$

f $f(\alpha)=-\alpha$ 3

$]0;5]$ (C_f) $f(5)$ $f(1)$ 4

4

$\mathbb{R}$ x f

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

$\ln 3$ 0	$-\ln 2$ 0	$\ln 2$ 0	$f(x)=0$	1
-3	$+\infty$	$-\infty$	$f(x)$ $+\infty$ x	2
			$\left[\frac{ln2}{2};+\infty\right[$ f	3
-1	2	1	m f m $[0;2]$	4

7

$]0;+\infty[$ g I

$$g(x)=-4+2x(1+\ln x)$$

$\lim\limits_{\substack{x\to 0\\ >}} x\ln x=0$ $\lim\limits_{x\to+\infty} g(x)$ $\lim\limits_{\substack{x\to 0\\ >}} g(x)$ 1

$]0;+\infty[$ g 2

α $g(x)=0$ 3

$1{,}4<\alpha<1{,}5$

$]0;+\infty[$ $g(x)$ 4

$]0;+\infty[$ f II

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

(C_f)

$(O;\vec{i};\vec{j})$

$\lim\limits_{\substack{x\to 0\\ >}} f(x)$ 1

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

$]0;+\infty[$ x 2

$$f'(x)=\frac{g(x)}{x}$$

f

(C_f) 3

(C_f) (T) 4

1

$f(\alpha)\simeq -0{,}41$ (C_f) (T)

$]0;+\infty[$ F (5

$$F(x)=(x^2-4x)\ln x-\frac{1}{2}x^2+4x$$

$]0;+\infty[$ f F

(C_f)

$x=2$ $x=1$ $y=0$

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8

D_f f

$D_f =]-\infty; 0[\cup]0; +\infty[$

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

(C_f)

$(O; \vec{\imath}; \vec{\jmath})$

$\lim\limits_{\substack{>\\ x\to 0}} f(x)$ $\lim\limits_{\substack{<\\ x\to 0}} f(x)$ $\lim\limits_{x\to-\infty} f(x)$ 1

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

D_f x 2

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

f

(Δ) (C_f) 3

$y = 1$

(C_f) (T) 4

$\ln 3$

$]0; +\infty[$ g 5

$$g(x) = f(x) - \frac{9}{4}(x - \ln 3) - 1$$

g

x	0	$+\infty$
$g'(x)$	$+$	
$g(x)$	$-\infty$ ↗	$+\infty$

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

(C_f) $]0; +\infty[$

(T)

(C_f) (T) $f(\ln 2)$ 6

$]-\infty; 0[\cup]0; 3]$

8

$]0; +\infty[$ g I

$$g(x) = x^2 + 3\ln x - 3$$

g 1

α $g(x) = 0$ 2

x $g(x)$ $1.40 < \alpha < 1.41$

$]0; +\infty[$ f II

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

(C_f)

$(O; \vec{\imath}; \vec{\jmath})$

$\lim\limits_{\substack{>\\ x\to 0}} f(x)$ 1

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

x 2

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

f 3

$y = x + 1$ (Δ) 4

(C_f)

(Δ) (C_f)

$f(\alpha) \simeq 1.68$ (C_f) (Δ) 5

$h(x) = \frac{1}{2}(\ln x)^2$ h 6

$]0; +\infty[$ $x \longmapsto \frac{\ln x}{x}$

S

(C_f)

$y = x + 1$ $x = e$ $x = 1$

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$\mathbb{R}$ g I

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

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

g 2

α $g(x) = 0$ 3

$$1.46 < \alpha < 1.48$$

x $g(x)$ 4

q II

C_M

$[0; 10]$

$$C_M(q) = \frac{1}{2}q^2 - q + 1 - \frac{1}{2}\ln(q^2 + 1)$$

$[0; 10]$ q 1

$$C'_M(q) = \frac{g(q)}{q^2 + 1}$$

C_M 2

$\alpha \simeq 1.47$

3

2 C 4

8

$\mathbb{R}$ g I

$$g(x) = 2x - 1 - e^{2x}$$

g 1

$g(x)$ 2

$\mathbb{R}$ f II

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

(C_f)

$\|\vec{i}\| = 2cm$ $(O; \vec{i}; \vec{j})$

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

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

f 2

α $f(x) = 0$ 3

$$-0.25 < \alpha < -0.24$$

A (C_f)

$\left(0 ; \frac{-1}{2}\right)$

A (C_f) (T)

(C_f) (T) 4

$A(\alpha)$ 5

(C_f)

$y = 0$ $x = \alpha$ $x = 0$

$$A(\alpha) = \frac{1}{3}(4\alpha^3 - 12\alpha^2 + 6\alpha + 3)\ cm^2$$

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8

$[0;+\infty[$ g I

$$g(x) = 1 + (1-x)e^{-x+1}$$

x g

$g(x) > 0$ $[0;+\infty[$

$[0;+\infty[$ f II

$$f(x) = x + xe^{-x+1}$$

(C_f)

$(O;\vec{i};\vec{j})$

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

(C_f) $y = x$

(Δ) (C_f)

$[0;+\infty[$ x 2

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

α $f(x) = 4$ 3

$3.75 < \alpha < 3.77$

(C_f) (T) 4

(C_f) (Δ) (T) 1

$[0;+\infty[$ F 5

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

f F

$[0;+\infty[$

$\int_1^4 f(x)dx$

q C_m 6

f $0 \le q \le 7$

$q \in [0;7]$ $C_m(q) = f(q)$

4

C_T

4000 1000

8

$]-2;8[$ f

$$f(x) = \ln(x+2) + \ln(-x+8) - \ln 16$$

f (C_f)

$(O;\vec{i};\vec{j})$

$2cm$

f 1

$]-2;8[$

$]-2;8[$ x 2

f f' $f'(x) = \frac{-2x+6}{(x+2)(-x+8)}$

$]-2;8[$ $f'(x)$ 3

f

(C_f) 4

$]-2;8[$ x 5

$f(6-x) = f(x)$ $]-2;8[$ $(6-x)$

(C_f) 6

$]-2;8[$ F 7

$F(x) = (x+2)\ln(x+2) + (x-8)\ln(-x+8) - 2x - x\ln 16$

$]-2;8[$ f F

cm^2 8

(C_f)

$x = 4$ $x = 0$ $y = 0$

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