

$a \in \mathbb{R}^* - \{1\} : a$

n-icim

-
- I
- II
- III
- V

: 1

$$f(x) = x$$

f

$$f(x) = 10^x :$$

$$10^x = e^{x \ln 10} \quad - 1$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow -\infty} f(x) : \quad - 2$$

f - 3

() (C) - 4

$$\left(\vec{0}; \vec{i}, \vec{j} \right)$$

:

$$e^{\ln \alpha} = \alpha \quad) 10^x = e^{\ln 10^x} : \quad (1)$$

$$\ln x^n = n \ln x \quad) 10^x = e^{x \ln 10} :$$

$$f(x) = e^{x \ln 10} :$$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} e^{x \ln 10} = 0 \quad (2)$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} e^{x \ln 10} = +\infty$$

: (3)

$$f(x) = e^{x \ln 10} :$$

\mathbb{R}

f

: \mathbb{R}

$$x \mapsto e^x \quad x \mapsto x \ln 10$$

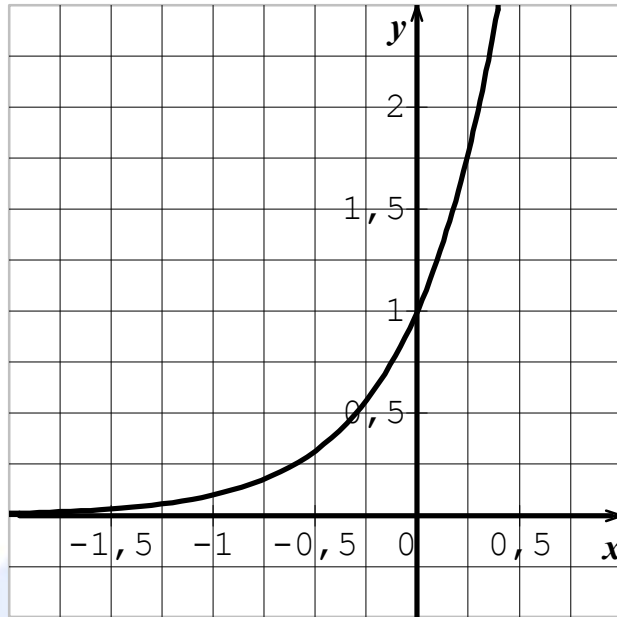
$$f'(x) = (\ln 10) \cdot e^{x \ln 10} = (\ln 10) \cdot 10^x$$

: (4)

$$-\infty \quad y = 0 : \quad (C)$$

$$\lim_{x \rightarrow +\infty} \frac{f(x)}{x} = \lim_{x \rightarrow +\infty} \frac{e^{x \ln 10}}{x} = \lim_{x \rightarrow +\infty} \ln 10 \times \frac{e^{x \ln 10}}{x \ln 10} = +\infty :$$

:



: 2

$$f(x) = \left(\frac{1}{2}\right)^x : \quad x \quad f$$

$$\left(\frac{1}{2}\right)^x = e^{-x \ln 2} : \quad -1$$

$$\lim_{x \rightarrow +\infty} f(x) \quad \lim_{x \rightarrow -\infty} f(x) : \quad -2$$

$$\cdot \mathbb{R} \quad f \quad -3$$

$$f \quad (\gamma) \quad -4$$

. ()

:

$$\left(\frac{1}{2}\right)^x = e^{x \ln \frac{1}{2}} : \quad \left(\frac{1}{2}\right)^x = e^{\ln\left(\frac{1}{2}\right)^x} \quad (1)$$

$$f(x) = e^{-x \ln 2} : \quad \left(\frac{1}{2}\right)^x = e^{-x \ln 2} :$$

: (2)

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} e^{-x \ln 2} = +\infty \quad \lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} e^{-x \ln 2} = 0$$

: (2)

$$\mathbb{R} : \quad \text{http://www.onefd.edu} \quad x \rightarrow e^x \quad x \mapsto -x \ln 2 \quad \text{جميع الحقوق محفوظة} \quad f$$

. \mathbb{R}

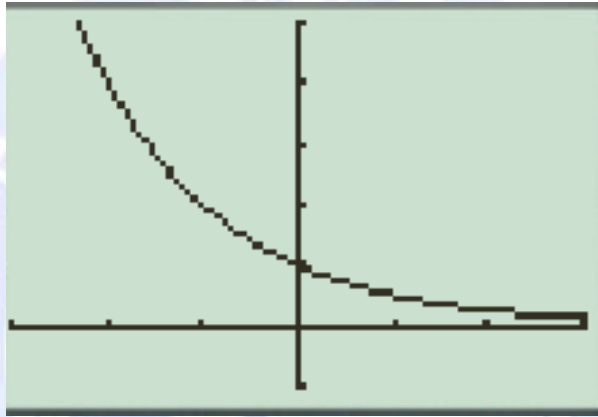
$$f'(x) = (-\ln 2) \left(\frac{1}{2}\right)^x : \quad f'(x) = (-\ln 2) e^{-x \ln 2} :$$

$$+\infty \quad y = 0 \quad : \quad - (4) \quad (\gamma)$$

$$\lim_{x \rightarrow -\infty} \frac{f(x)}{x} = \lim_{x \rightarrow -\infty} \frac{e^{-x \ln 2}}{x} = \lim_{x \rightarrow -\infty} (-\ln 2) \times \frac{e^{-x \ln 2}}{-x \ln 2} = -\infty :$$

(C) :

(\gamma) -



$$a^b = e^{b \ln a} \quad : \quad -1$$

$$: \quad b \quad a \quad :$$

$$: \quad b \quad a \quad : \quad -2$$

- $\ln a^b = b \ln a$
- $a^{b+b'} = a^b \cdot a^{b'}$
- $a^{b-b'} = \frac{a^b}{a^{b'}}$
- $(a^b)^{b'} = a^{b \times b'}$
- $(a \cdot a')^b = a^b \cdot a'^b$
- $\left(\frac{a}{a'}\right)^b = \frac{a^b}{a'^b}$

$$\left(\frac{1}{2}\right)^\pi \cdot \left(\frac{1}{2}\right)^{\sqrt{3}} = \left(\frac{1}{2}\right)^{\pi + \sqrt{3}} ; \left[\left(\frac{3}{2}\right)^{\frac{1}{2}}\right]^{\sqrt{2}} = \left(\frac{3}{2}\right)^{\frac{\sqrt{2}}{2}} ; \left(\frac{\sqrt{2}}{\pi}\right)^{\frac{2}{3}} = \frac{(\sqrt{2})^{\frac{2}{3}}}{\pi^{\frac{2}{3}}}$$

$$a \in \mathbb{R}^* - \{1\} : a$$

$$a \neq 0 \quad : \quad -1$$

$$\mathbb{R} \quad x \mapsto a^x = e^{x \ln a} \quad a$$

$$exp_a \quad a$$

$$x \mapsto a^x : f \quad -$$

$$\mathbb{R} \quad f$$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} a^x = \lim_{x \rightarrow -\infty} e^{x \ln a} = 0 \quad : \quad a > 1 \quad ($$

$$\ln a > 0$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} a^x = \lim_{x \rightarrow +\infty} e^{x \ln a} = +\infty$$

$$\ln a < 0 \quad : \quad 0 < a < 1 \quad ($$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} a^x = \lim_{x \rightarrow -\infty} e^{x \ln a} = +\infty$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} a^x = \lim_{x \rightarrow +\infty} e^{x \ln a} = 0$$

$$x \mapsto a^x : f$$

$$f(x) = e^{x \ln a}$$

$$: \quad \begin{array}{c} x \mapsto e^x \quad x \mapsto x \ln a \\ f' \quad \quad \quad \mathbb{R} \quad \quad \quad f \quad \quad \quad \mathbb{R} \\ f'(x) = (\ln a) \cdot e^{x \ln a} \end{array}$$

$$f \quad f'(x) > 0 : \quad \ln a > 0 : a > 1 \quad \bullet$$

$$f'(x) < 0 \quad \ln a < 0 : 0 < a < 1 \quad \bullet$$

$$0 < a < 1$$

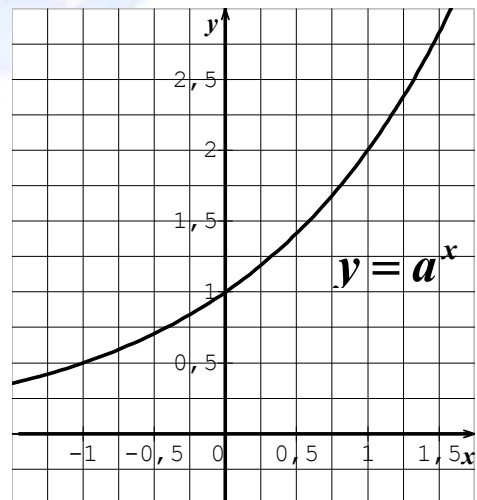
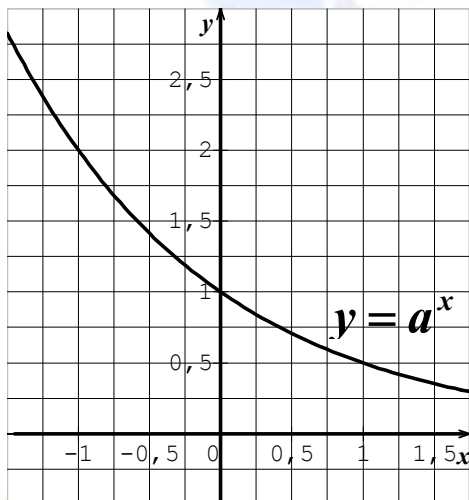
$$a > 1$$

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

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

$$0 < a < 1$$

$$a > 1$$



$$n \in \mathbb{N}^* - \{1\} \quad n - ieim$$

$$: \quad (n \in \mathbb{N}^* - \{1\}) \quad n - ieim \quad -1$$

$$n - ieim \quad \mathbb{R}_+ \quad a \quad \mathbb{N}^* - \{1\} \quad n$$

$${}^n\sqrt{a}$$

$${}^n\sqrt{0} = 0 \quad {}^n\sqrt{a} = a^{\frac{1}{n}} \quad : a > 0$$

$$p, n \quad b \quad b, a$$

- ${}^n\sqrt{a} \times {}^b\sqrt{b} = {}^n\sqrt{a \cdot b}$
- $\frac{{}^n\sqrt{a}}{{}^n\sqrt{b}} = {}^n\sqrt{\frac{a}{b}}$
- ${}^n\sqrt{a} = {}^{np}\sqrt{a^p}$
- $({}^n\sqrt{a})^n = a$
- $({}^n\sqrt{a})^p = {}^n\sqrt{a^p}$
- ${}^n\sqrt{{}^p\sqrt{a}} = {}^{np}\sqrt{a}$

$$[0; +\infty[\quad n \quad n \in \mathbb{N}^* - \{1\} \quad x \mapsto {}^n\sqrt{x} \quad -2$$

$$: \quad f(x) = x^{\frac{1}{n}} :$$

$$f(0) = 0 \quad f(x) = e^{\frac{1}{n} \ln x} : x \neq 0$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} e^{\frac{1}{n} \ln x} = +\infty$$

$$f'(x) = \frac{1}{n} \times \frac{1}{x} e^{\frac{1}{n} \ln x} : x \in]0; +\infty[$$

. x

$$f'(x) > 0$$

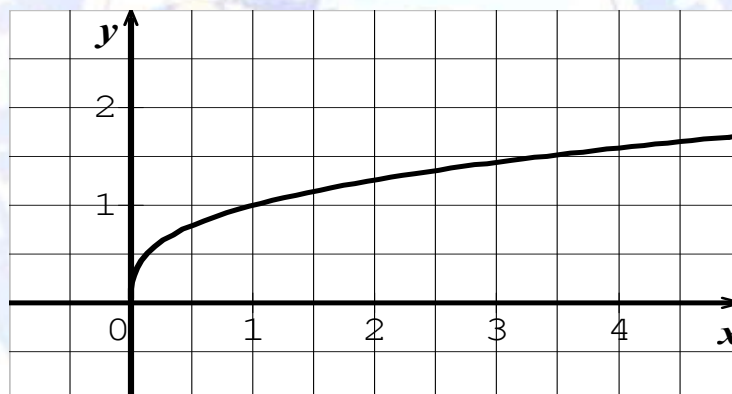
x	0	$+\infty$
$f'(x)$	+	
$f(x)$	0	$+\infty$

$$\lim_{x \rightarrow +\infty} \frac{f(x)}{x} = \lim_{x \rightarrow +\infty} \frac{\sqrt[n]{x}}{x} = \lim_{x \rightarrow +\infty} \frac{x^{\frac{1}{n}}}{x} = \lim_{x \rightarrow +\infty} x^{\frac{1}{n}} \cdot x^{-1} = \lim_{x \rightarrow +\infty} x^{\frac{1}{n}-1}$$

$$= \lim_{x \rightarrow +\infty} x^{\frac{1-n}{n}} = \lim_{x \rightarrow +\infty} e^{\frac{1-n}{n} \ln x} = 0$$

$+\infty$:

$$\frac{1-n}{n} < 0$$



$$\mathbb{R}^* \quad n \quad x \rightarrow x^n : f$$

$$x^\alpha = e^{\alpha \ln x} :]0; +\infty[$$

$$\lim_{x \rightarrow +\infty} f(x) = +\infty \quad \lim_{\substack{x \rightarrow 0 \\ x > 0}} f(x) = 0 \quad : \alpha > 0$$

$$\lim_{x \rightarrow +\infty} f(x) = 0 \quad \lim_{\substack{x \rightarrow 0 \\ x > 0}} f(x) = +\infty \quad : \alpha < 0$$

$]0; +\infty[$ f

$f'(x) = \alpha \cdot \frac{1}{x} e^{\alpha \ln x} :$

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

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

:

$\alpha < 0$

$\alpha > 0$

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

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

:

$\alpha > 0$

f

$\lim_{x \rightarrow +\infty} \frac{f(x)}{x} = \lim_{x \rightarrow +\infty} \frac{x^\alpha}{x} = \lim_{x \rightarrow +\infty} x^{\alpha-1} = \lim_{x \rightarrow +\infty} e^{(\alpha-1)\ln x}$

$\lim_{x \rightarrow +\infty} \frac{f(x)}{x} = +\infty : \alpha > 1$

$\lim_{x \rightarrow +\infty} \frac{f(x)}{x} = 0 : \alpha < 1$

$() f(x) = x : \alpha = 1$

$\alpha < 0$

$y = 0 \quad x = 0 :$

$\alpha < 0$

$\alpha > 1$

:

$$\lim_{x \rightarrow -\infty} 5^{-x} = 0 \quad -11$$

$$\lim_{x \rightarrow +\infty} x \cdot 3^x = 0 \quad -12$$

$$\sqrt{10^x} = 10^{\frac{x}{2}} \quad -13$$

$$\sqrt[6]{5^3} = \sqrt{5} \quad -14$$

$$x \in \mathbb{R}_+^*, \sqrt{x} = e^{\frac{\ln x}{2}} \quad -15$$

$$x \in \mathbb{R}_+^*, x^x = e^{\frac{\ln x}{x}} \quad -16$$

$$]0; +\infty[\quad x \mapsto x^x \quad -17$$

$$x \mapsto (1 + \ln x) \times x^x$$

$$x \in \mathbb{R}_+^*, x^{\frac{1}{4}} = e^{\frac{\ln x}{4}} \quad -18$$

$$\lim_{x \rightarrow +\infty} x^{-\frac{1}{3}} = +\infty \quad -19$$

$$\lim_{x \rightarrow +\infty} x^{\sqrt{2}} = +\infty \quad -20$$

$$\boxed{2}$$

:

$$\mathbb{R}$$

$$10^x - 10^{\frac{x}{2}} - 6 = 0 \quad (2) \quad 3^{2x} - 7 \cdot 3^x + 12 = 0 \quad (1)$$

$$10^{4x} - 4 \cdot 10^{2x} + 3 \leq 0 \quad (5) \quad \left(\frac{1}{2}\right)^x > 0,0001 \quad (4) \quad 10^x < 5 \quad (3)$$

$$\boxed{3}$$

:

$$f(x) = 10^{|x|} \quad (2) \quad f(x) = \frac{3^x}{3^x - 1} \quad (1)$$

$$f(x) = \frac{1}{\left(\frac{1}{2}\right)^x - 1} \quad (4) \quad f(x) = \frac{1}{10^x + 2} \quad (3)$$

$$f(x) = x \cdot \left(\frac{1}{2}\right)^x \quad (6) \quad f(x) = (x+4)3^x \quad (5)$$

4

$$f(x) = \left(\frac{1}{2}\right)^{2x} - 5\left(\frac{1}{2}\right)^x + 3 \quad (2) \quad f(x) = 10^{x^2-2x} \quad (1)$$

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

$$f(x) = \left(\frac{1}{3}\right)^{x(x-1)} \quad (6) \quad f(x) = \frac{5^{2x} - 1}{5^{2x} + 1} \quad (5)$$

5

$$f(x) = \frac{10^x - 1}{10^x} : \quad x \quad f$$

$$f \quad -1$$

$$f \quad (C) \quad -2$$

$$\cdot (0; \vec{i}, \vec{j})$$

$$(C) \quad ($$

$$\cdot (C) \quad ($$

$$\cdot 0 \quad (C) \quad -3$$

$$\cdot (C) \quad -4$$

6

$$f(x) = 2^x - 2^{-x} : \quad f$$

$$\cdot (0; \vec{i}, \vec{j})$$

7

$$: \quad f_\lambda \quad \lambda$$

$$(C_\lambda) \quad \cdot f_\lambda(x) = \lambda \cdot 3^x - 3^{-x}$$

$$\cdot (C_{-1}), (C_1), (C_0)$$

$f(x) = |x|^x :$ x 8
 (C) f $f(1)$
-

$(o; \vec{i}, \vec{j})$

$g(x) = |x|^{|x|} :$ g (2)

g -

$g(x)$ -

(γ) -

9

$\left(5^2 + 5^{\frac{4}{3}} \cdot 8^{\frac{2}{3}}\right)^{\frac{1}{2}} + \left(8^2 + 5^{\frac{2}{3}} \cdot 8^{\frac{4}{3}}\right)^{\frac{1}{2}} = \left(5^{\frac{2}{3}} + 8^{\frac{2}{3}}\right)^{\frac{2}{3}} :$

10

$f(x) = \sqrt[3]{x^3 - x} :$ f

$[1; +\infty[$

(C) f

$(o; \vec{i}, \vec{j})$

1

$$\sqrt{\quad} (5 \quad \times \quad) (4 \quad \sqrt{\quad} (3 \quad \sqrt{\quad} (2 \quad \sqrt{\quad} (1$$

$$\sqrt{\quad} (10 \quad \times \quad) (9 \quad \sqrt{\quad} (8 \quad \times \quad) (7 \quad \times \quad) (6$$

$$\sqrt{\quad} (17 \quad \times \quad) (16 \quad \sqrt{\quad} (15 \quad \sqrt{\quad} (14 \quad \sqrt{\quad} (13 \quad \times \quad) (12 \quad \times \quad) (11$$

$$\sqrt{\quad} (20 \quad \sqrt{\quad} (19 \quad \sqrt{\quad} (18$$

2

$$y^2 - 7y + 12 = 0 : \quad 3^x = y \quad 3^{2x} - 7 \cdot 3^x + 12 = 0 : \quad (1$$

$$3^x = 4 \quad 3^x = 3 : \quad y_2 = 4 \quad y_1 = 3 \quad \Delta = 1$$

$$x = 1 : \quad 3^x = 3^1 \bullet$$

$$x \ln 3 = \ln 4 : \quad \ln 3^x = \ln 4 : \quad 3^x = 4 \bullet$$

$$S = \left\{ 1 ; \frac{\ln 4}{\ln 3} \right\} : \quad x = \frac{\ln 4}{\ln 3} :$$

$$\left(10^{\frac{x}{2}} \right)^2 - 10^{\frac{x}{2}} - 6 = 0 : \quad 10^x - 10^{\frac{x}{2}} - 6 = 0 : \quad (2$$

$$t^2 - t - 6 = 0 : \quad 10^{\frac{x}{2}} = t :$$

$$t_2 = 3 \quad t_1 = -2 \quad \Delta = 25$$

$$10^{\frac{x}{2}} > 0 \quad 10^{\frac{x}{2}} = -2 : \quad t = -2 \quad -$$

$$\ln 10^{\frac{x}{2}} = \ln 3 : \quad 10^{\frac{x}{2}} = 3 : \quad t = 3 : \quad -$$

$$x = \frac{2 \ln 3}{\ln 10} : \quad \frac{x}{2} \ln 10 = \ln 3 :$$

$$S = \left\{ 2 \frac{\ln 3}{\ln 10} \right\} :$$

$$\ln 10^x < \ln 5 : \quad 10^x < 5 : \quad (3$$

$$x < \frac{\ln 5}{\ln 10} :$$

$$x \ln 10 < \ln 5 :$$

$$S =]-\infty ; \frac{\ln 5}{\ln 10}[:$$

$$\ln\left(\frac{1}{2}\right)^x > \ln 0,0001 : \quad \left(\frac{1}{2}\right)^x > 0,0001 : \quad (4)$$

$$-x \ln 2 > -4 \ln 10 : \quad x \ln \frac{1}{2} > \ln 10^{-4} :$$

$$S =]-\infty ; 4 \cdot \frac{\ln 10}{\ln 2}[: \quad x < \frac{4 \ln 10}{\ln 2} :$$

$$z^2 - 4z + 3 \leq 0 : \quad 10^{2x} = z \quad 10^{4x} - 4 \cdot 10^{2x} + 3 \leq 0 : \quad (5)$$

$$z^2 - 4z + 3 :$$

$$z_2 = 3 ; \quad z_1 = 1 ; \quad \Delta = 4$$

$$z^2 - 4z + 3 = (z-1)(z-3) :$$

$$10^{4x} - 4 \cdot 10^{2x} + 3 = (10^{2x} - 1)(10^{2x} - 3) :$$

$$10^{2x} - 3 \quad 10^{2x} - 1 :$$

$$x = 0 \quad 2x = 0 \quad 10^{2x} = 1 \quad 10^{2x} - 1 = 0$$

$$x > 0 \quad 2x > 0 \quad 10^{2x} > 1 \quad 10^{2x} - 1 > 0$$

$$x = 2x \ln 10 = \ln 3 \quad \ln 10^{2x} = \ln 3 \quad 10^{2x} = 3 \quad 10^{2x} - 3 = 0$$

$$x = \frac{\ln 3}{2 \ln 10} :$$

$$\ln 10^{2x} > \ln 3 : \quad 10^{2x} > 3 : \quad 10^{2x} - 3 > 0$$

$$x > \frac{\ln 3}{2 \ln 10} : \quad 2x \ln 10 > \ln 3 :$$

$$(10^{2x} - 1)(10^{2x} - 3) :$$

x	$-\infty$	0	$\frac{\ln 3}{2 \ln 10}$	$+\infty$
$10^{2x} - 1$	-	○	+	+
$10^{2x} - 3$	-	○	-	+
$(10^{2x} - 1)(10^{2x} - 3)$	+	○	-	+

<http://www.onefd.edu.dz>

$$S \left[0 ; \frac{\ln 3}{2 \ln 10} \right[:$$

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$$f(x) = \frac{3^x}{3^x - 1} \quad : \quad (1)$$

$$x \neq 0 : \quad 3^x \neq 1 : \quad 3^x - 1 \neq 0 : \quad f$$

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

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} \frac{3^x}{3^x - 1} = \lim_{x \rightarrow -\infty} \frac{e^{x \ln 3}}{e^{x \ln 3} - 1} = 0$$

$$\lim_{\substack{x \rightarrow 0 \\ x < 0}} f(x) = \lim_{\substack{x \rightarrow 0 \\ x < 0}} \frac{3^x}{3^x - 1} = -\infty$$

$$\lim_{\substack{x \rightarrow 0 \\ x > 0}} f(x) = \lim_{\substack{x \rightarrow 0 \\ x > 0}} \frac{3^x}{3^x - 1} = +\infty$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} \frac{3^x}{3^x \left(-1 - \frac{1}{3^x} \right)} = \lim_{x \rightarrow +\infty} \frac{1}{1 - \frac{1}{3^x}} = 1$$

$$f(x) = 10^{|x|} \quad : \quad (2)$$

$$. \mathbb{R} \quad f$$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} 10^{|x|} = \lim_{x \rightarrow -\infty} e^{|x| \cdot \ln 10} = +\infty$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} 10^{|x|} = \lim_{x \rightarrow +\infty} e^{|x| \cdot \ln 10} = +\infty$$

$$f(x) = \frac{1}{10^x + 2} \quad : \quad (3)$$

$$10^x \neq -2 : \quad 10^x + 2 \neq 0 : \quad f$$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} \frac{1}{10^x + 2} = \lim_{x \rightarrow -\infty} \frac{1}{e^{x \ln 10} + 2} = \frac{1}{2}$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} \frac{1}{10^x + 2} = \lim_{x \rightarrow +\infty} \frac{1}{e^{x \ln 10} + 2} = 0$$

$$f(x) = \frac{1}{\left(\frac{1}{2}\right)^x - 1} \quad : \quad (4)$$

$$\left(\frac{1}{2}\right)^x - 1 \neq 0 \quad :$$

$$x \neq 0 \quad : \quad \left(\frac{1}{2}\right)^x \neq 1 \quad :$$

$$]-\infty ; 0[\cup]0 ; +\infty[\quad :$$

$$\left(\frac{1}{2}\right)^x = e^{-x \ln 2} \quad :$$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} \frac{1}{e^{-x \ln 2} - 1} = 0 \quad :$$

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

$$\lim_{\substack{x \rightarrow 0 \\ x < 0}} f(x) = \lim_{\substack{x \rightarrow 0 \\ x < 0}} \frac{1}{\left(\frac{1}{2}\right)^x - 1} = +\infty$$

$$\left(\frac{1}{2}\right)^x - 1 \xrightarrow{>} 0 \quad :$$

$$\lim_{\substack{x \rightarrow 0 \\ x > 0}} f(x) = \lim_{\substack{x \rightarrow 0 \\ x > 0}} \frac{1}{\left(\frac{1}{2}\right)^x - 1} = -\infty$$

$$\left(\frac{1}{2}\right)^x - 1 \xrightarrow{<} 0 :$$

$$\left(\frac{1}{2}\right)^x - 1 :$$

x	$-\infty$	0	$+\infty$
$\left(\frac{1}{2}\right)^x - 1$	+	○	-

$$f(x) = (x+4)3^x : \quad (5)$$

$$\mathbb{R} : \quad -$$

:

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} (x+3)e^{x \ln 3} = \lim_{x \rightarrow -\infty} x \cdot e^{x \ln 3} + 3e^{x \ln 3} = 0$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} (x+3)e^{x \ln 3} = +\infty$$

$$f(x) = x \left(\frac{1}{2}\right)^x : \quad (6)$$

$$\mathbb{R} : \quad -$$

:

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} x \left(\frac{1}{2}\right)^x = \lim_{x \rightarrow -\infty} x \cdot e^{x \ln \frac{1}{2}} = \lim_{x \rightarrow -\infty} x \cdot e^{-x \ln 2} = -\infty$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} x e^{-x \ln 2} = \lim_{x \rightarrow +\infty} \left(\frac{-1}{\ln 2}\right) \cdot (-x \ln 2) e^{-x \ln 2} = 0$$

4

$$f(x) = 10^{x^2-2x} : \quad (1)$$

:

$$x \mapsto x^2 - 2x \quad \mathbb{R} \quad -$$

$$. \mathbb{R} \quad x \mapsto 10^x$$

$$f(x) = e^{(x^2-2x) \ln 10} :$$

$$f'(x) = 2(x-1)(\ln 10) \cdot 10^{x^2-2x}$$

$$f(x) = \left(\frac{1}{2}\right)^{2x} - 5\left(\frac{1}{2}\right)^x + 3 \quad : \quad (2)$$

\mathbb{R} f -

\mathbb{R} f -

. \mathbb{R}

$$f(x) = e^{-x \ln 2} - 5e^{-2x \ln 2} + 3 :$$

$$f'(x) = (-2 \ln 2)e^{-2x \ln 2} - (-\ln 2)e^{-x \ln 2} :$$

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

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

$x \neq 0$ $4^x \neq 1$ $4^x - 1 \neq 0$ f -

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

D_f f -

$$f(x) = \frac{e^{x \ln 4}}{e^{x \ln 4} - 1} \quad : \quad . \mathbb{R}$$

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

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

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

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

$$f(x) = \ln(2^x - 1) \quad : \quad (4)$$

:

$$D_f =]0 ; +\infty[:$$

 D_f
 D_f
 f

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

$$f'(x) = \frac{(\ln 2) \cdot 2^x}{2^x - 1} : \quad f'(x) = \frac{(\ln 2) \cdot e^{x \ln 2}}{e^{x \ln 2} - 1} :$$

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

$$D_f =]-\infty ; +\infty[: \quad 5^{2x} + 1 \neq 0 \quad \mathbb{R} \quad f$$

 $\mathbb{R} \quad f$

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

$$f'(x) = \frac{(2 \ln 5) \cdot e^{2x \ln 5} [e^{2x \ln 5} + 1] - (2 \ln 5) e^{2x \ln 5} [e^{2x \ln 5} - 1]}{(e^{2x \ln 5} + 1)^2} :$$

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

$$f'(x) = \frac{(4 \ln 5) 5^{2x}}{(5^{2x} + 1)^2} : \quad f'(x) = \frac{4(\ln 5) \cdot e^{2x \ln 5}}{(e^{2x \ln 5} + 1)^2}$$

$$f(x) = \left(\frac{1}{3}\right)^{x(x-1)} : \quad (6)$$

$$D_f =]-\infty ; +\infty[: \quad \mathbb{R} \quad f$$

 $:$
 \mathbb{R}

<http://www.onefd.edu.dz>


 \mathbb{R}
 f

$$f(x) = e^{-x(x-1) \ln 3}$$

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

$$f'(x) = (-2x + 1)(\ln 3) \cdot \left(\frac{1}{3}\right)^{x(x+1)} :$$

5

$$D_f =]-\infty; +\infty[: f \quad -1$$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} \frac{e^{x \ln 10} - 1}{e^{x \ln 10}} = -\infty$$

$$\begin{aligned} \lim_{x \rightarrow +\infty} f(x) &= \lim_{x \rightarrow +\infty} \frac{10^x - 1}{10^x} = \lim_{x \rightarrow +\infty} \frac{10^x \left(1 - \frac{1}{10^x}\right)}{10^x} \\ &= \lim_{x \rightarrow +\infty} 1 - \frac{1}{10^x} = 1 \end{aligned}$$

$$f(x) = \frac{e^{x \ln 10} - 1}{e^{x \ln 10}}$$

$$f'(x) = \frac{(\ln 10)e^{x \ln 10} \cdot e^{x \ln 10} - (\ln 10)e^{x \ln 10} \cdot (e^{x \ln 10} - 1)}{(e^{x \ln 10})^2}$$

$$f'(x) = \frac{(\ln 10)10^x \cdot 10^x - (\ln 10)10^x \cdot (10^x - 1)}{(10^x)^2}$$

$$f'(x) = \frac{(\ln 10)10^x \cdot [10^x - 10^x + 1]}{10^x \cdot 10^x} = \frac{\ln 10}{10^x}$$

$$: \mathbb{R} \quad f \quad f'(x) > 0$$

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

$$10^x - 1 = 0 : f(x) = 0 : \quad -a (2)$$

$$(C) \cap (y'y) = \{0\} : x = 0 : 10^x = 1 : \quad -$$

$$: \quad -b$$

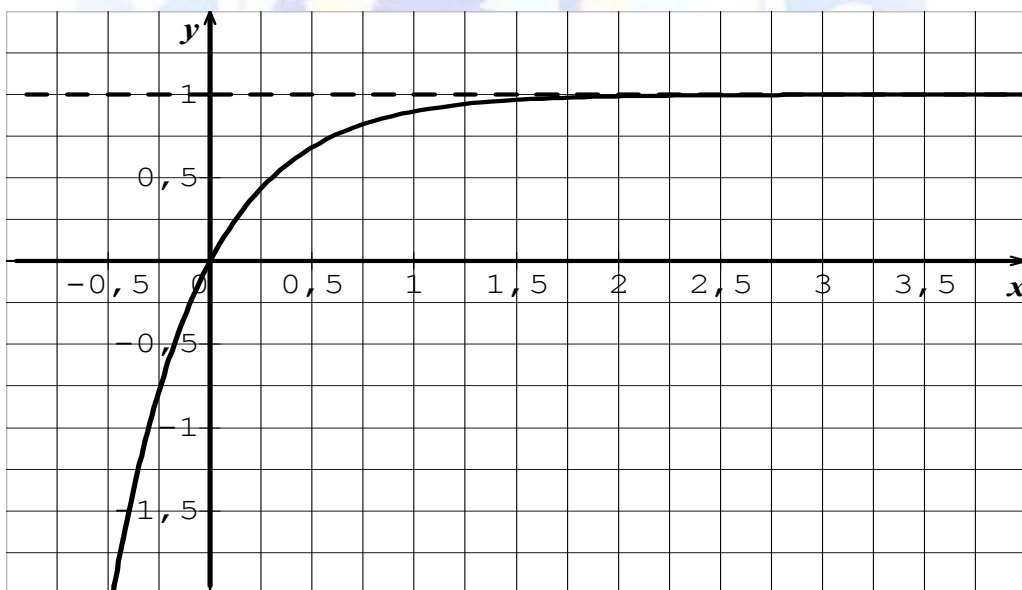
$$+\infty \quad y = 1$$

$$\lim_{x \rightarrow -\infty} \frac{f(x)}{x} = \lim_{x \rightarrow -\infty} \frac{10^x - 1}{x10^x} = -\infty$$

$$y = f'(0) \cdot (x - 0) + f(0) : \quad -3$$

$$y = x \ln 10 : f'(0) = \ln 10 ; f(0) = 0$$

(C) -4



$$D_f =]-\infty; +\infty[: f$$

$$\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} 2^x - 2^{-x} = +\infty$$

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} 2^x - 2^{-x} = -\infty$$

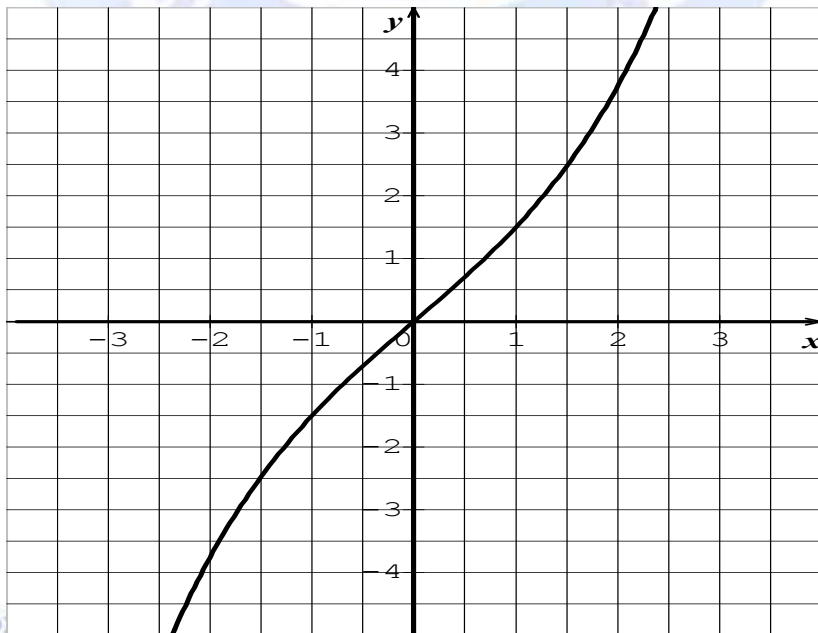
$$f(x) = e^{x \ln 2} - e^{-x \ln 2}$$

$$f'(x) = \ln 2 \cdot e^{x \ln 2} + (\ln 2) e^{-x \ln 2} = 2^x \ln 2 + 2^{-x} \ln 2$$

$$f'(x) = (2^x + 2^{-x}) \ln 2$$

\mathbb{R} f $f'(x) > 0$:

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



$$D_f =]-\infty; +\infty[: \lambda \quad f_\lambda$$

$$\lim_{x \rightarrow -\infty} f_0(x) = \lim_{x \rightarrow -\infty} (-3^{-x}) = -\infty : \lambda = 0$$

$$\lim_{x \rightarrow +\infty} f_0(x) = \lim_{x \rightarrow +\infty} (-3^{-x}) = 0$$

$$f'_0(x) = (\ln 3) \times 3^{-x}$$

$$f_0 \quad f'_0(x)$$

x	$-\infty$	$+\infty$
$f'_0(x)$		+
$f_0(x)$	$-\infty$	0

$$f_\lambda(x) = \lambda \cdot 3^x - 3^{-x} = \lambda \cdot e^{x \ln 3} - e^{-x \ln 3} : \lambda > 0$$

$$\lim_{x \rightarrow -\infty} f_\lambda(x) = \lim_{x \rightarrow -\infty} \lambda \cdot e^{x \ln 3} - e^{-x \ln 3} = -\infty$$

$$\lim_{x \rightarrow +\infty} f_\lambda(x) = \lim_{x \rightarrow +\infty} \lambda \cdot e^{x \ln 3} - e^{-x \ln 3} = +\infty$$

$$\begin{aligned} f'_\lambda(x) &= \lambda (\ln 3) e^{x \ln 3} + (\ln 3) e^{-x \ln 3} \\ &= \lambda (\ln 3) \cdot 3^x + (\ln 3) 3^{-x} \\ &= (\ln 3) [\lambda \cdot 3^x + 3^{-x}] \end{aligned}$$

$$\mathbb{R} \quad f : \quad f'(x) > 0 :$$

x	$-\infty$	$+\infty$
$f'_\lambda(x)$		+
$f_\lambda(x)$	$-\infty$	$+\infty$

$$f_\lambda(x) = \lambda e^{x \ln 3} - e^{-x \ln 3} \quad D_f =]-\infty; +\infty[: \lambda < 0$$

$$\lim_{x \rightarrow -\infty} f_\lambda(x) = -\infty$$

$$\lim_{x \rightarrow +\infty} f_\lambda(x) = -\infty$$

$$f'_\lambda(x) = \lambda(\ln 3) \cdot e^{x \ln 3} + (\ln 3) e^{-x \ln 3} = (\ln 3) [\lambda e^{x \ln 3} + e^{-x \ln 3}]$$

$$f'_\lambda(x) = (\ln 3) [\lambda 3^x + 3^{-x}] \quad :$$

$$\lambda \cdot 3^x = -3^{-x} \quad : \quad \lambda \cdot 3^x + 3^{-x} = 0 \quad : \quad f'(x) = 0$$

$$\ln 3^{2x} = \ln \left(\frac{-1}{\lambda} \right) \quad : \quad 3^{2x} = \frac{-1}{\lambda} \quad : \quad \frac{3^x}{3^{-x}} = \frac{-1}{\lambda} \quad :$$

$$: \quad x = \frac{-\ln \left(-\frac{1}{\lambda} \right)}{2 \ln 3} \quad :$$

$$\lambda \cdot 3^x > -3^{-x} \quad : \quad \lambda \cdot 3^x + 3^{-x} > 0 \quad : \quad f'(x) > 0$$

$$3^{2x} < \frac{-1}{\lambda} \quad \lambda \cdot 3^{2x} > -1 \quad : \quad \frac{\lambda 3^x}{3^{-x}} > -1 \quad :$$

$$2x \ln 3 < \ln \left(\frac{-1}{\lambda} \right) \quad : \quad \ln 3^{2x} < \ln \left(\frac{-1}{\lambda} \right) \quad :$$

$$x < \frac{-\ln \left(-\frac{1}{\lambda} \right)}{2 \ln 3} \quad : \quad 2x \ln 3 < -\ln \left(-\frac{1}{\lambda} \right) \quad :$$

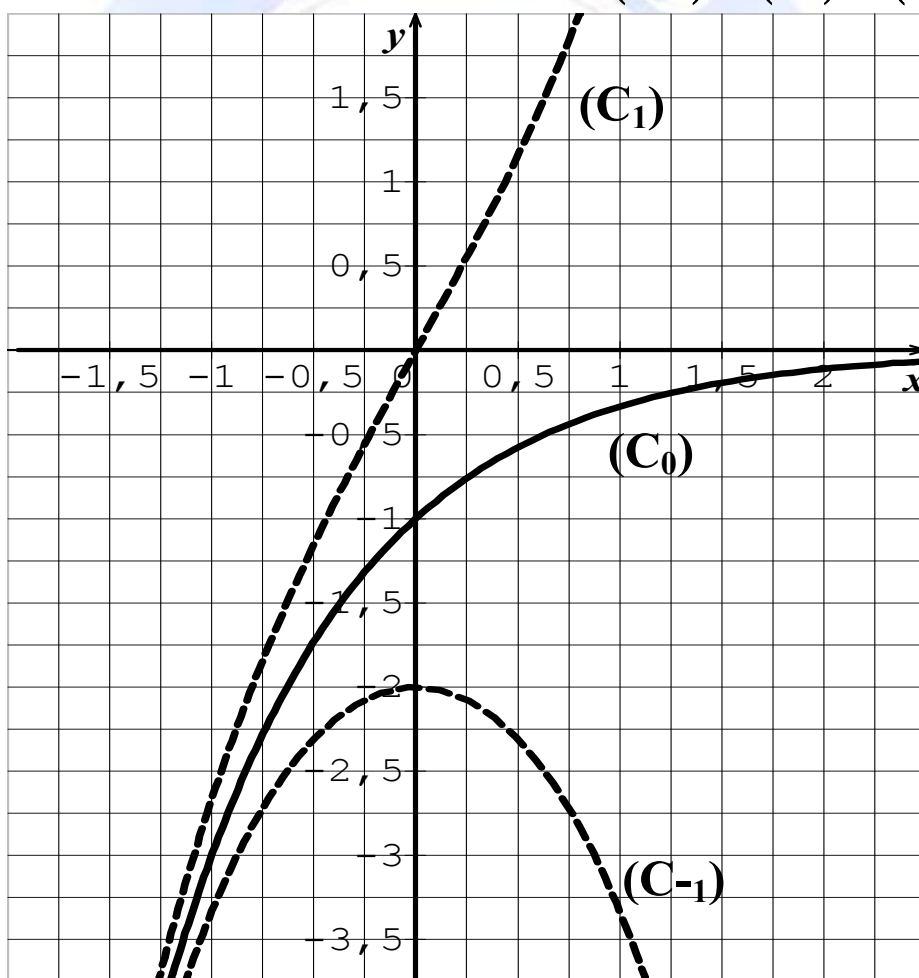
$$\left[-\infty ; \frac{-\ln \left(-\frac{1}{\lambda} \right)}{2 \ln 3} \right] \quad \mathbf{f}$$

$$\left[\frac{-\ln \left(-\frac{1}{\lambda} \right)}{2 \ln 3} ; +\infty \right] \quad :$$

:

x	$-\infty$	$\frac{-\ln(-\frac{1}{\lambda})}{2\ln 3}$	$+\infty$
$f'_\lambda(x)$	+	0	-
$f_\lambda(x)$	$+\infty$	$f\left(\frac{-\ln(-\frac{1}{\lambda})}{2\ln 3}\right)$	$-\infty$

: (C_{-1}) (C_1) (C_0)



$$f(x) = e^{x \ln|x|} \quad : \quad f$$

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

$$\lim_{x \rightarrow -\infty} f(x) = \lim_{x \rightarrow -\infty} e^{x \ln|x|} = 0$$

$$\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^-} e^{x \ln|x|} = \lim_{x \rightarrow 0^-} e^{-(-x) \ln(-x)} = 1$$

$$\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^+} e^{x \ln x} = 1 \qquad \lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} e^{x \ln x} = +\infty$$

$$f'(x) = (\ln|x| + 1) e^{x \ln|x|} \qquad f'(x) = \left(1 \cdot \ln|x| + x \cdot \frac{1}{x} \right) e^{x \ln|x|}$$

$$|x| = \frac{1}{e} \qquad \ln|x| = -1 \qquad \ln|x| + 1 = 0 \qquad f'(x) = 0$$

$$x = \frac{1}{e} \qquad x = -\frac{1}{e}$$

$$|x| > \frac{1}{e} \qquad \ln|x| > -1 \qquad \ln|x| + 1 > 0 : \quad f'(x) > 0$$

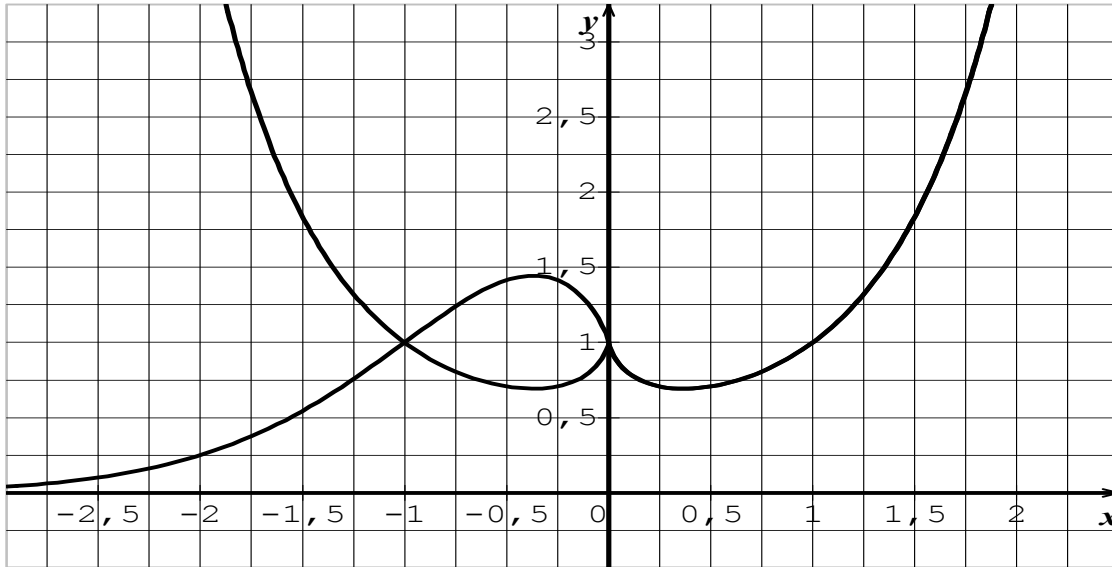
$$f \quad x \in \left] -\infty ; -\frac{1}{e} \right[\cup \left] \frac{1}{e} ; +\infty \right[$$

$$\left] 0 ; \frac{1}{e} \right[\quad ; \quad \left] \frac{1}{e} ; 0 \right[\qquad f$$

x	$-\infty$	$-\frac{1}{e}$	0	$\frac{1}{e}$	$+\infty$
$f'(x)$	+	-	-	-	+
$f(x)$	$f\left(\frac{-1}{e}\right)$ 		1	$f\left(\frac{1}{e}\right)$ 	

$$\lim_{x \rightarrow +\infty} \frac{f(x)}{x} = \lim_{x \rightarrow +\infty} \frac{e^{x \ln|x|}}{x} = \lim_{x \rightarrow +\infty} \frac{e^{x \ln x}}{x \ln x} = +\infty$$

$$f\left(\frac{1}{e}\right) = e^{\frac{1}{e} \ln \frac{1}{e}} = e^{-\frac{1}{e}} \approx 0,7 \quad f\left(-\frac{1}{e}\right) = e^{-\frac{1}{e} \ln \frac{1}{e}} = e^{\frac{1}{e}} \approx 1,5$$



$$D_g =]-\infty ; 0[\cup]0 ; +\infty[: \quad g \quad -2$$

$$-x \in D_g \quad D_g \quad x$$

$$g \quad g(-x) = g(x) : \quad g(-x) = |-x|^{-x}$$

$$\begin{cases} g(x) = x^x & x > 0 \\ g(x) = (-x)^{-x} & x < 0 \end{cases} \quad g(x)$$

$$:(\gamma) \quad -$$

$$g(x) = f(x) : x > 0$$

$$]0; +\infty[\quad (C) \quad (\gamma)$$

$$(\gamma) :]-\infty; 0[$$

g

$$5^2 = 5^{\frac{2}{3}} \cdot 5^{\frac{2}{3}} \quad ; \quad 8^2 = 8^{\frac{4}{3}} \cdot 8^{\frac{2}{3}} :$$

$$\left(5^2 + 5^{\frac{4}{3}} \cdot 8^{\frac{2}{3}} \right)^{\frac{1}{2}} = \left[5^{\frac{4}{3}} \cdot 5^{\frac{2}{3}} + 5^{\frac{4}{3}} \cdot 8^{\frac{2}{3}} \right]^{\frac{1}{2}} :$$

$$= \left[5^{\frac{4}{3}} \left(5^{\frac{2}{3}} + 8^{\frac{2}{3}} \right) \right]^{\frac{1}{2}} = 5^{\frac{2}{3}} \left(5^{\frac{2}{3}} + 8^{\frac{2}{3}} \right)^{\frac{1}{2}}$$

$$\left(8^2 + 5^{\frac{2}{3}} \cdot 8^{\frac{4}{3}} \right)^{\frac{1}{2}} = \left[8^{\frac{4}{3}} \cdot 8^{\frac{2}{3}} + 5^{\frac{2}{3}} \cdot 8^{\frac{4}{3}} \right]^{\frac{1}{2}}$$

$$= \left[8^{\frac{4}{3}} \cdot \left(8^{\frac{2}{3}} + 5^{\frac{2}{3}} \right) \right]^{\frac{1}{2}} = 8^{\frac{2}{3}} \left(5^{\frac{2}{3}} + 8^{\frac{2}{3}} \right)^{\frac{1}{2}}$$

:

$$\left(5^2 + 5^{\frac{4}{3}} \cdot 8^{\frac{2}{3}} \right)^{\frac{1}{2}} + \left(8^2 + 5^{\frac{2}{3}} \cdot 8^{\frac{4}{3}} \right)^{\frac{1}{2}} = \left(5^{\frac{2}{3}} + 8^{\frac{2}{3}} \right)^{\frac{1}{2}} \left(5^{\frac{2}{3}} + 8^{\frac{2}{3}} \right) = \left(5^{\frac{2}{3}} + 8^{\frac{2}{3}} \right)^{\frac{3}{2}}$$

:

$$f(x) = e^{\frac{1}{3} \ln(x^3 - x)} \quad : \quad x > 1 \quad *$$

$$f(x) = 0 \quad : \quad x = 1 \quad *$$

$$: [1; +\infty[$$

:

(1)

$$\lim_{\substack{x \rightarrow 1 \\ x > 1}} f(x) = \lim_{\substack{x \rightarrow 1 \\ x > 1}} e^{\frac{1}{3} \ln(x^3 - x)} = 0$$

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

: (2)

f

$]1; +\infty[$

$$f'(x) = \frac{\frac{1}{3}(3x^2 - 1)}{x^3 - x} \times e^{\frac{1}{3}\ln(x^3 - x)} :$$

$$x = \frac{\sqrt{3}}{3} : \quad x^2 = \frac{1}{3} : \quad 3x^2 - 1 = 0 : \quad f'(x) = 0$$

$$3x^2 - 1 > 0 \quad x^3 - x > 0 :]1; +\infty[\quad x = -\frac{\sqrt{3}}{3} :$$

:

x	$-\infty$	-1	$-\frac{\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$+\infty$
x	-	-	-	0	+	+	+
$x^2 - 1$	+	0	-	-	-	0	+
$x(x^2 - 1)$	-	0	+	0	-	-	+
$3x^2 - 1$	+	+	0	-	0	+	+

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

$]1; +\infty[$

$$f(1) = 0 : \quad 1 \quad (3)$$

$$\lim_{\substack{x \rightarrow 1 \\ x > 1}} \frac{f(x) - f(1)}{x - 1} = \lim_{\substack{x \rightarrow 1 \\ x > 1}} \frac{(x^3 - x)^{\frac{1}{3}}}{x - 1} = \lim_{\substack{x \rightarrow 1 \\ x > 1}} \left(\frac{x^3 - x}{(x - 1)^3} \right)^{\frac{1}{3}}$$

$$= \lim_{\substack{x \rightarrow 1 \\ x > 1}} \left[\frac{x(x-1)(x+1)}{(x-1)(x-1)^2} \right]^{\frac{1}{3}} = \lim_{\substack{x \rightarrow 1 \\ x > 1}} \left[\frac{x(x+1)}{(x-1)^2} \right]^{\frac{1}{3}} = +\infty$$

- 4

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

- 5

(C)

$$\begin{aligned} \lim_{x \rightarrow +\infty} \frac{f(x)}{x} &= \lim_{x \rightarrow +\infty} \frac{(x^3 - x)^{\frac{1}{3}}}{x} \\ &= \lim_{x \rightarrow +\infty} \left(\frac{(x^3 - x)^{\frac{1}{3}}}{(x^3)^{\frac{1}{3}}} \right) = \lim_{x \rightarrow +\infty} \left(\frac{x^3 - x}{x^3} \right)^{\frac{1}{3}} = \lim_{x \rightarrow +\infty} \left(1 - \frac{1}{x^2} \right)^{\frac{1}{3}} = 1 \end{aligned}$$

$$\lim_{x \rightarrow +\infty} [f(x) - x] = \lim_{x \rightarrow +\infty} (x^3 - x)^{\frac{1}{3}} - x$$

$$= \lim_{x \rightarrow +\infty} \frac{\left[(x^3 - x)^{\frac{1}{3}} - x \right] \left[(x^3 - x)^{\frac{2}{3}} + x(x^3 - x)^{\frac{1}{3}} + x^2 \right]}{(x^3 - x)^{\frac{2}{3}} + x(x^3 - x)^{\frac{1}{3}} + x^2}$$

$$= \lim_{x \rightarrow +\infty} \frac{\left[(x^3 - x)^{\frac{1}{3}} \right]^3 - x^3}{(x^3 - x)^{\frac{2}{3}} + x(x^3 - x)^{\frac{1}{3}} + x^2}$$

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

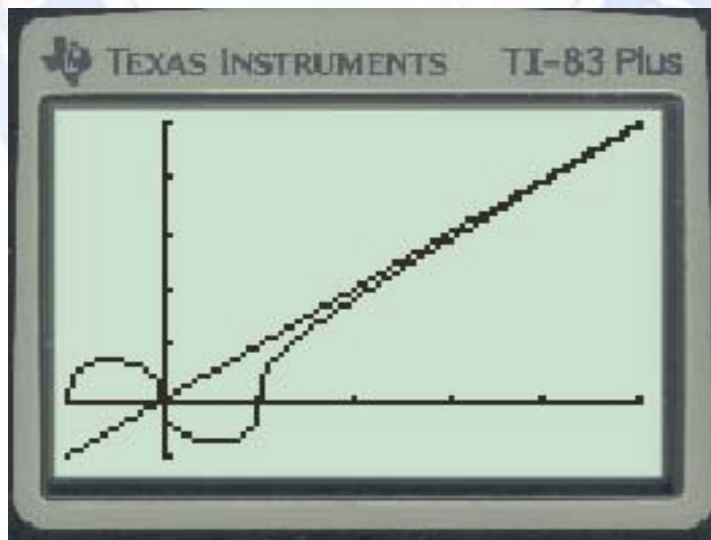
$$= \lim_{x \rightarrow +\infty} \frac{-x}{\left[x^3 \left(1 - \frac{1}{x^2} \right) \right]^{\frac{2}{3}} + x(x^3 - x)^{\frac{1}{3}} + x^2}$$

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

$$= \lim_{x \rightarrow +\infty} \frac{-x}{x \left[x \left(1 - \frac{1}{x^2} \right)^{\frac{2}{3}} + (x^3 - x)^{\frac{1}{3}} + x \right]}$$

$$= \lim_{x \rightarrow +\infty} \frac{-1}{x \left(1 - \frac{1}{x^2} \right)^{\frac{2}{3}} + (x^3 - x)^{\frac{1}{3}} + x} = 0$$

$y = x$



$[1 ; +\infty[$:

$\cdot [-1 ; +\infty[$ جميع الحقوق محفوظة