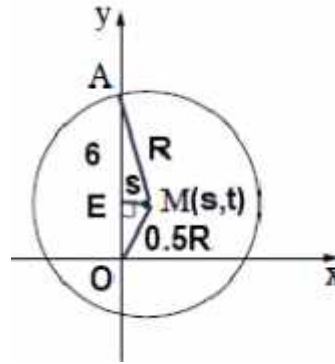


$s^2 + 6^2 = R^2 \rightarrow (1) s^2 + 36 = R^2 : (\triangle MAE \text{ "}) , AE = 6$

$s^2 + t^2 = (0.5R)^2 \rightarrow (2) s^2 + t^2 = 0.25R^2 : (\triangle MOE \text{ "}) , MO = 0.5R$



$$\begin{cases} s^2 + 36 = R^2 \\ s^2 + t^2 = 0.25R^2 \quad / \cdot (-4) \end{cases}$$

$$+ \begin{cases} s^2 + 36 = R^2 \\ -4s^2 - 4t^2 = -R^2 \end{cases}$$

$$-3s^2 - 4t^2 + 36 = 0$$

$$3s^2 + 4t^2 = 36 \quad / : 36$$

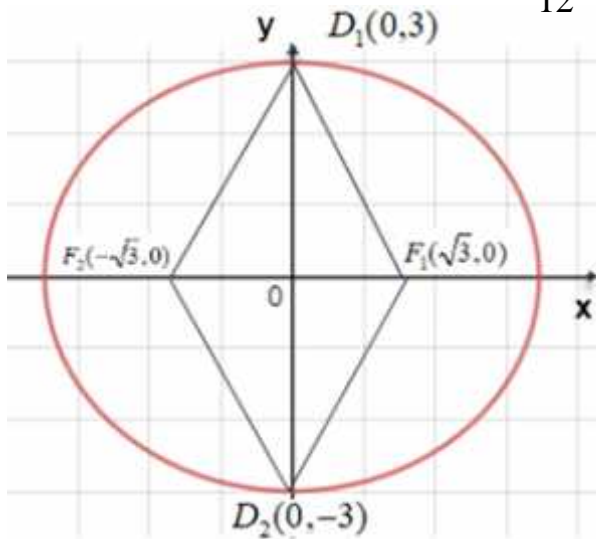
$$\frac{s^2}{12} + \frac{t^2}{9} = 1$$

$$\boxed{\frac{x^2}{12} + \frac{y^2}{9} = 1}$$

, M(s, t) , " "

$\frac{x^2}{12} + \frac{y^2}{9} = 1 :$, ,

$\frac{x^2}{12} + \frac{y^2}{9} = 1 :$, :



$a^2 = 12, b^2 = 9, \rightarrow c^2 = a^2 - b^2 = 12 - 9 = 3 \text{ (1)}$

$F_2(-\sqrt{3}, 0), F_1(\sqrt{3}, 0) :$

$F_2F_1 = 2\sqrt{3}$

$y - D_1(0, 3), D_2(0, -3)$

$S_{F_1D_1F_2D_2} = \frac{2\sqrt{3} \cdot 6}{2} = 6\sqrt{3}$, ,

$6\sqrt{3} , F_1D_1F_2D_2 , :$

"

$$\cdot 2a \quad ,$$

(2) .

$$\cdot 4a \quad ,$$

$$F_1 D_1 F_2 D_2$$

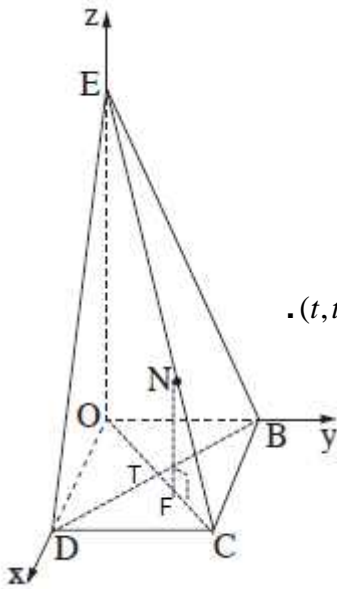
$$\cdot P_{F_1 D_1 F_2 D_2} = 4a = 4 \cdot \sqrt{12} = 8\sqrt{3} \quad :$$

$$F_1 D_1 F_2 D_2$$

:

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$z = 0$, $[x, y]$, OBCD, OBCDE.

$\underline{x} = (0, 0, 1)$, OE

$E(0, 0, 12)$, $D(4, 0, 0)$, $C(4, 0, 0)$, $B(0, 4, 0)$, $O(0, 0, 0)$:

$\underline{x} = (0, 0, 12) + t(1, 1, -3)$, $\overrightarrow{EC} = \underline{C} - \underline{E} = \underline{x} = (4, 4, -12)$

$\underline{x} = (0, 0, 12) + t(1, 1, -3)$ EC :

$(t, t, 12 - 3t)$, EC, N.

$x_N = x_F$, F, $z = 0$, N

$x_N = 3$, $x_F = 3$, 3, y - F

$t = 3$, EC,

$N(3, 3, 3)$

$N(3, 3, 3)$:

$a = 0$ BCN, $\underline{x} = (1, 0, 0)$, x - BC.

$\underline{x} = (0, 4, 0) + t(1, 1, -3) + s(1, 0, 0)$ BCN

$(a, b, c) \cdot (1, 1, -3) = 0 \rightarrow a + b - 3c = 0,$

$a = 0 \rightarrow b = 3c, \rightarrow c = 1, b = 3$

$d = -12$ - $B(0, 4, 0)$ $3y + z + d = 0$ BCN

$3y + z - 12 = 0$ BCN :

OBCD BCN

$$\cos \angle(f_{BCN}, f_{OBCD}) = \frac{|(0, 3, 1) \cdot (0, 0, 1)|}{\sqrt{0^2 + 3^2 + 1^2} \cdot \sqrt{0^2 + 0^2 + 1^2}} = \frac{|1|}{\sqrt{10}} \rightarrow \angle(f_{BCN}, f_{OBCD}) = 71.565^\circ$$

BC, BCE, BCN

EB, BO - BC -

EB BC -

EBO, $\angle EBO$

$$\tan \angle EBO = \frac{EO}{BO} = \frac{12}{4} = 3 \rightarrow \angle EBO = 71.565^\circ$$

71.565° OBCD BCN :

"

• $(T - \quad)$

KOBCD .

• $\underline{x} = (0, 0, 1)$

,

OBCD

• $T(2, 2, 0)$

$$, x_T = \frac{x_B + x_D}{2} = \frac{0 + 4}{2} = 2, y_T = \frac{y_B + y_D}{2} = \frac{4 + 0}{2} = 2$$

• $\underline{x} = (2, 2, 0) + q(0, 0, 1)$, K

,

:

$$\bar{z} = r \operatorname{cis}(-\theta) \quad , z \neq 0 \quad , z = r \operatorname{cis} \theta \quad :$$

$$z^3 = \bar{z}$$

$$(r \operatorname{cis} \theta)^3 = r \operatorname{cis}(-\theta)$$

$$r^3 \operatorname{cis} 3\theta = r \operatorname{cis}(-\theta) \quad / : \operatorname{cis}(-\theta) \neq 0$$

$$\boxed{r=1} \quad , 4\theta = 360^\circ k \quad \rightarrow \theta = 90^\circ k$$

$$z_1 = \operatorname{cis} 0^\circ = 1 \quad z_2 = \operatorname{cis} 90^\circ = i$$

$$z_3 = \operatorname{cis} 180^\circ = -1 \quad z_4 = \operatorname{cis} 270^\circ = -i$$

$$\operatorname{cis} 270^\circ = -i \quad , \operatorname{cis} 180^\circ = -1 \quad , \operatorname{cis} 90^\circ = i \quad , \operatorname{cis} 0^\circ = 1 \quad :$$

$$\bar{z} = r \operatorname{cis}(-\theta) \quad , z \neq 0 \quad , z = r \operatorname{cis} \theta \quad : \quad (1)$$

$$z^2 \cdot (\bar{z})^2 = 1 \quad , \quad ,$$

$$(r \operatorname{cis} \theta)^2 \cdot (r \operatorname{cis}(-\theta))^2 = 1$$

$$r^2 \operatorname{cis} 2\theta \cdot r^2 \operatorname{cis}(-2\theta) = 1$$

$$r^4 \operatorname{cis}(0)^\circ = 1 \quad \rightarrow r^4 = 1 \quad \rightarrow r = 1$$

$$x^2 + y^2 = 1 \quad , \quad ,$$

$$x^2 + y^2 = 1 \quad :$$

$$\quad (\quad) r = 1 \quad (2)$$

$$.45^\circ \quad , \quad , \quad , \quad (1)$$

$$\operatorname{cis} 0^\circ = 1 \quad :$$

$$\operatorname{cis} 45^\circ \quad , \quad ,$$

$$\operatorname{cis} 45^\circ)^4 = a \quad \rightarrow \operatorname{cis} 180^\circ = a \quad \rightarrow \boxed{a = -1} \quad , z^4 = a \quad ,$$

$$a = -1 \quad :$$

$$.r \quad , \quad , \quad , \quad (2)$$

$$\operatorname{cis} (270^\circ + r) \quad , \operatorname{cis} (180^\circ + r) \quad , \operatorname{cis} (90^\circ + r) \quad , \operatorname{cis} r \quad :$$

$$\operatorname{cis} (270^\circ + r) = -\operatorname{cis} (90^\circ + r) \quad , \operatorname{cis} (180^\circ + r) = -\operatorname{cis} r \quad :$$

$$\quad , 180^\circ \quad (\quad) \quad ,$$

$$.0- \quad , 0 \quad ,$$

$$\quad :$$

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

$$x = \ln 2, \quad x = \ln 2$$

$$\begin{aligned} e^{a \ln 2} - 3e^{\ln 2} + 2 &= 0 \\ (e^{\ln 2})^a - 3 \cdot 2 + 2 &= 0 \\ 2^a = 4 &\rightarrow \boxed{a=2} \\ a &= 2 : \end{aligned}$$

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

$$f(x) = \frac{e^{2x} - e^x}{e^{2x} - 3e^x + 2} = \frac{e^x(e^x - 1)}{(e^x - 2)(e^x - 1)} \rightarrow f(x) = \frac{e^x}{(e^x - 2)} \quad (x \neq 0, x \neq \ln 2)$$

(" ")

$$(0, -1), \quad x = 0$$

$$f(x) = \frac{e^x}{(e^x - 2)} \quad (x \neq 0, x \neq \ln 2), \quad x \neq 0, x \neq \ln 2$$

(1).

$$x = \ln 2$$

$$y = 1, \quad f(10) = \frac{e^{10}}{e^{10} - 2} = 1.00009$$

$$y = 0, \quad f(-10) = \frac{e^{-10}}{e^{10} - 2} = -2 \cdot 10^{-5}$$

:

$$y = 1, \quad f(x) = \frac{e^x}{e^x - 2} \rightarrow \frac{e^x}{e^x} = 1, \quad e^x \rightarrow +\infty, x \rightarrow +\infty$$

$$y = 0, \quad f(x) = \frac{e^x}{e^x - 2} \rightarrow \frac{0}{0 - 2} = 0^-, \quad e^x \rightarrow 0, x \rightarrow -\infty$$

$$x \rightarrow +\infty, \quad () \quad y = 1 :$$

$$x \rightarrow -\infty, \quad () \quad y = 0$$

$$x = \ln 2 :$$

(, , -)

(2)

$$f(x) = \frac{e^x}{(e^x - 2)} \quad (x \neq 0, x \neq \ln 2)$$

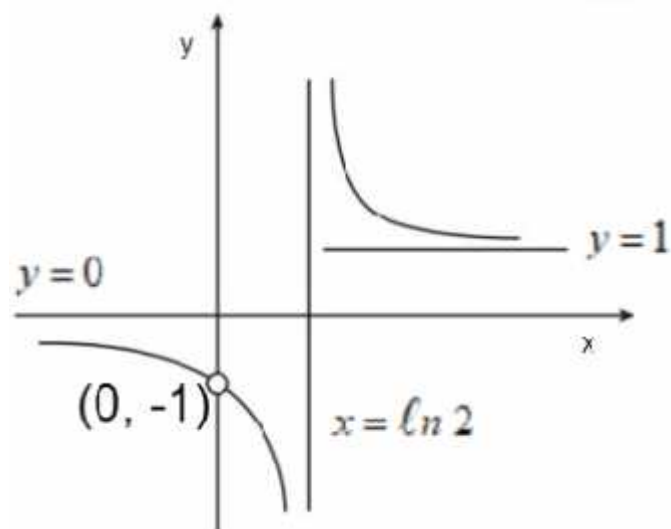
$$f'(x) = \frac{e^x(e^x - 2) - e^x \cdot e^x}{(e^x - 2)^2}$$

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

$$\boxed{f'(x) = \frac{-2e^x}{(e^x - 2)^2}} \rightarrow f'(x) < 0 \quad (x \neq 0, x \neq \ln 2)$$

$x < \ln 2, x \neq 0$ $x > \ln 2$:

(3)



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

$$h(x) = \left| f(x) - \frac{1}{2} \right|$$

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

$$f(x) = \left(x - \ln 2 \right)$$

$$h(x) = \left(x - \ln 2 \right) \quad (1)$$

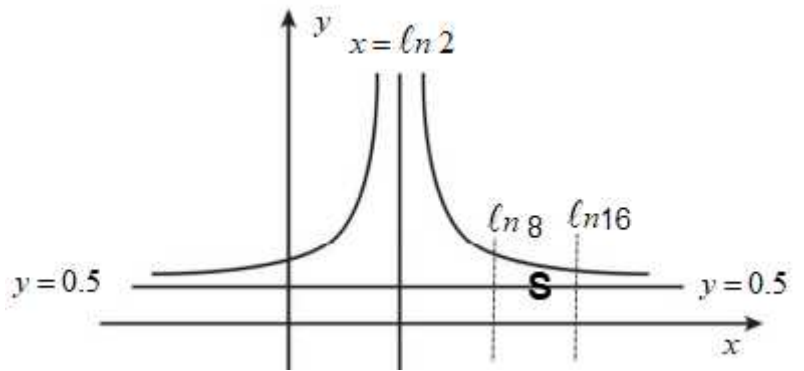
$$x \rightarrow +\infty \quad (\quad) \quad y = 0.5 :$$

$$x \rightarrow -\infty \quad (-(0 - 0.5) = 0.5 !!!) \quad y = 0.5$$

$$x = \ln 2 :$$

"

:(3) ,) (2)



(3)

$$h(x) = \frac{e^x}{e^x - 2} - \frac{1}{2} : x > \ln 2$$

$$e^x - 2$$

$$S = \int_{\ln 8}^{\ln 16} \left(\frac{e^x}{e^x - 2} - \frac{1}{2} \right) dx$$

$$S = \int_{\ln 8}^{\ln 16} \left(\frac{1}{e^x - 2} \cdot e^x - \frac{1}{2} \right) dx$$

$$S = \ln(e^x - 2) - 0.5x \Big|_{\ln 8}^{\ln 16}$$

$$x = \ln 16 \quad \ln 14 - \ln 4 \sim 1.253$$

$$x = \ln 8 \quad \ln 6 - \ln \sqrt{8} \sim 0.752$$

$$\boxed{S \sim 0.500724}$$

$$.0.500724$$

:

$$. x = \ln 2$$

$h(x)$

B - A

$$. \ln 8 - \ln 2 = \ln 2 - x_B : , x_A = \ln 8 ,$$

$$x_B = 2 \ln 2 - \ln 8 = \ln 4 - \ln 8 = \ln 0.5$$

$$y_B = \left| \frac{e^{\ln 0.5}}{e^{\ln 0.5} - 2} - \frac{1}{2} \right| = \left| \frac{0.5}{0.5 - 2} - \frac{1}{2} \right| = \left| -\frac{5}{6} \right| = \frac{5}{6} \left. \vphantom{y_B} \right\} \boxed{B(\ln 0.5, \frac{5}{6})}$$

$$. h(x) = -\left(\frac{e^x}{e^x - 2} - \frac{1}{2} \right) : x < \ln 2 ,$$

$$. B(\ln 0.5, \frac{5}{6}) :$$

$f(x)$, x , $f(x)$.
 $h(x)$, $h(x) = e^{f(x)}$
 $e^{f(x)}$, $h'(x) = e^{f(x)} f'(x)$
 $f(x)$, x
 (\quad)
 (\quad) ,
 $-x$,
 $:$

$f(x) = x \ln(x^n)$.
 $x \neq 0$, n :
 $x > 0$, $-$ n
 $y -$, n .
 $x -$

$$0 = x \ln(x^n)$$

$$\ln(x^n) = 0$$

$$x^n = 1$$

$$n \text{ odd } x = 1 \text{ or } n \text{ even } x = \pm 1$$

$(-1, 0), (1, 0)$, n :
 $(1, 0)$, $-$ n

$x -$ $f(x) = x \ln(x^n)$.
 $(-1, 0), (1, 0)$, $n -$
(1)

$$f(-x) = (-x) \ln[(-x)^n]$$

$$f(-x) = -x \ln(x)^n \leftarrow n \text{ is even}$$

$$\boxed{f(-x) = -f(x)}$$

$:$

() (2)

$$f(x) = x \ln(x^n)$$

$$f'(x) = \ln(x^n) + x \cdot \frac{nx^{n-1}}{x^n}$$

$$f'(x) = \ln(x^n) + n$$

$$0 = \ln(x^n) + n$$

$$\ln(x^n) = -n$$

$$x^n = e^{-n}$$

$$x = \pm e^{-1} \leftarrow n \text{ is even}$$

$$x = \pm \frac{1}{e}$$

$$f''(x) = \frac{nx^{n-1}}{x^n} \rightarrow f''(x) = \frac{n}{x}$$

$$f''\left(\frac{1}{e}\right) > 0 \rightarrow \min \left(\frac{1}{e}, -\frac{n}{e}\right)$$

$$f''\left(-\frac{1}{e}\right) < 0 \rightarrow \max \left(-\frac{1}{e}, \frac{n}{e}\right)$$

() () $\left(-\frac{1}{e}, \frac{n}{e}\right), \left(\frac{1}{e}, -\frac{n}{e}\right) :$

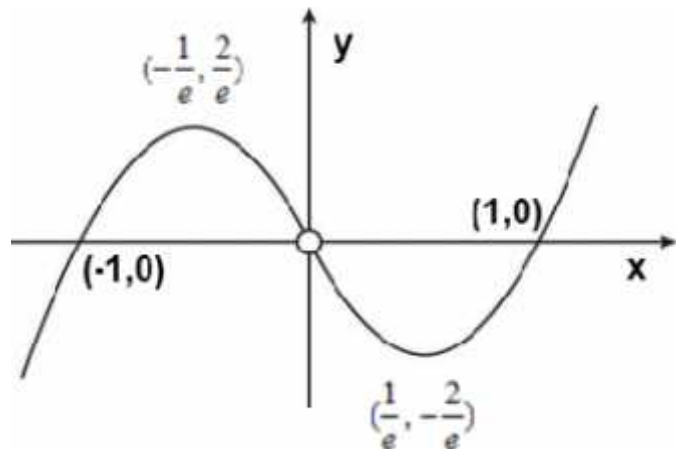
, $x \neq 0$, $f(x) = x \ln(x^2)$, $n = 2$ (3)

$\left(-\frac{1}{e}, \frac{2}{e}\right), \left(\frac{1}{e}, -\frac{2}{e}\right)$ $(-1, 0), (1, 0)$ $x -$

- $f(x) = x \ln(x^2) \rightarrow 0$ - () $x \rightarrow 0$

$\ln(x^2) \rightarrow -\infty$ $x \rightarrow 0$,

$f(x) = x \ln(x^2) \rightarrow 0$ - () $x \rightarrow \pm\infty$,



$$n) h(x) = e^{x \ln(x^n)}$$

$f(x) = x \ln(x^n)$

y

x

$(-\frac{1}{e}, e^e)$

$(\frac{1}{e}, e^{-\frac{n}{e}})$