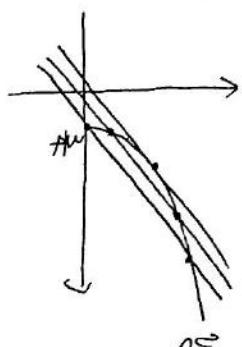


(1)

$$= \int_1^3 \pi ((\sqrt{4x-3})^2 - x^2) dx$$

(2)

$$= -\pi \int_1^3 (x-1)(x-3) dx$$



$$\sqrt{4x-3} = x + k$$

$$4x-3 = x^2 + 2kx + k^2$$

$$\Leftrightarrow 0 = x^2 + (2k+1)x + k^2 + 3$$

$$\Leftrightarrow 0 = (k+2)^2 - k^2 - 3$$

$$\therefore k < \frac{1}{4}$$

$$y = x + k \text{ が } (\frac{3}{4}, 0) \text{ を通る。}$$

$$k = -\frac{3}{4}$$

$$\boxed{\frac{3}{4} < k < \frac{1}{4}}$$

(3)

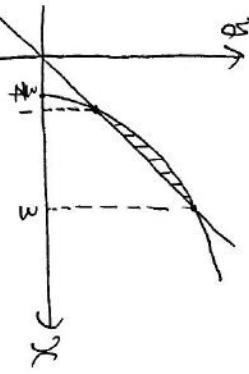
$$\text{左側の } k = -\frac{3}{4}, k = \frac{1}{4}$$

$$\frac{-C_{n+1} - C_n = S_{n+1} + (-1)^{n+1} + 1 - (n+2)}{C_{n+1} - C_n = S_n + 2n - 1} \quad (n \geq 2)$$

$$\Leftrightarrow C_{n+1} = 2C_n + 2n - 1 \quad (n \geq 2) \quad \text{①}$$

$$C_3 = C_2 + 2 + 1$$

$$= C_1 + 2 = 3$$



(4)

①を変形してみる

$$C_{n+1} + d(n+1) + \beta = 2(C_n + dn + \beta)$$

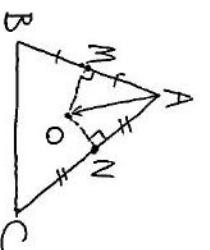
$$\Leftrightarrow C_{n+1} = 2C_n + dn - d + \beta$$

$$\Leftrightarrow \alpha = 2, \beta = 1.$$

$$\Leftrightarrow C_n = 2^n - 2^{n-1}$$

B, C, D は直線

$$\begin{cases} \overrightarrow{AD} = \overrightarrow{AB} + \overrightarrow{BC} \\ \overrightarrow{AD} = \overrightarrow{AC} + \overrightarrow{CD} \end{cases}$$



$$= (S - \frac{1}{2}) \overrightarrow{B} + \overrightarrow{C}$$

$$\overrightarrow{AD} = \overrightarrow{AB} + \overrightarrow{BD}$$

$$= \overrightarrow{AB} + t \overrightarrow{DC}$$

$$= \overrightarrow{AB} + (t - \frac{1}{2}) \overrightarrow{DC}$$

$$= \overrightarrow{AB} + t \overrightarrow{DC}$$

(2) # 点の座標をtとする。

$$\begin{cases} \text{傾き: } kt^2 = \frac{1}{t} \\ \text{座標: } kt^3 - 1 = \log t \end{cases}$$

$$\begin{cases} t = e^{\frac{1}{3}} \\ k = \frac{e^2}{3} \end{cases}$$

直線

$$y = e^{\frac{2}{3}}(x - e^{-\frac{1}{3}}) - \frac{2}{3}$$

(4)

$$\begin{aligned} &= \frac{1}{2} (2^{n+1} - 2^{n+2}) \\ &= \frac{1}{1-2} 2^{n+2} - 2 \cdot \frac{1}{2} n(n+1) - n \end{aligned}$$

$$\Leftrightarrow \begin{cases} (S - \frac{1}{2})9 + 6t = 0 \\ (S + (t - \frac{1}{2}))6 = 0 \end{cases}$$

$$\therefore S = \frac{2}{3}, t = \frac{5}{12}$$

$$\begin{aligned} (i) \text{ 余弦定理} \\ BC^2 = 3^2 + 4^2 - 2 \cdot 3 \cdot 4 \cos \frac{\pi}{3} = 13 \end{aligned}$$

$$\begin{aligned} \therefore BC = \sqrt{13} \\ \text{II法} \\ \overrightarrow{BP} = k \overrightarrow{BO} \\ = k(\overrightarrow{OB} - \overrightarrow{OB}) \end{aligned}$$

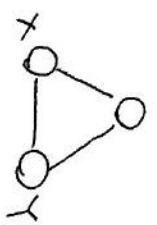
$$\begin{aligned} &= k(-\frac{1}{4}\overrightarrow{b} + \frac{5}{12}\overrightarrow{c}) \\ &= (\frac{1}{4}k)\overrightarrow{b} + \frac{5}{12}k\overrightarrow{c} \end{aligned}$$

$$\begin{aligned} \overrightarrow{AP} &= \overrightarrow{AB} + \overrightarrow{BP} \\ &= (\frac{1}{4}\overrightarrow{b} + \frac{5}{12}\overrightarrow{c}) \end{aligned}$$

$$k = \frac{9}{4}, \overrightarrow{AP} = \frac{15}{28}\overrightarrow{c}, \overrightarrow{AP} \cdot \overrightarrow{PC} = \frac{15}{28} \cdot 13,$$

(5)

(i) 今日達食達二日後



$$P(\text{明日食達}) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

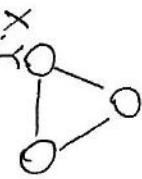
$$P(\text{明日達}) = \frac{3}{4}$$

(ii) 今日食達二日後

$$\Leftrightarrow (ky + \sqrt{3})^2 + 4y^2 = 4$$

$$\Leftrightarrow (k^2 + 4)y^2 + 2\sqrt{3}ky - 1 = 0$$

$$\Leftrightarrow y = \frac{\sqrt{3}k \pm \sqrt{4k^2 + 1}}{k^2 + 4}$$



$$P(\text{明日食達}) = \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{2}$$

$$P(\text{明日達}) = \frac{1}{2}$$

未だ未だ

$$(X) = \frac{3}{4} \cdot \frac{1}{4} = \frac{3}{16}$$

$$(Y) = P(\text{同食達}) = P(X \text{食達} \cap Y \text{食達})$$

未だ未だ

$$\Delta PPF = \frac{2\sqrt{4k^2 + 4}}{k^2 + 4} = \frac{4\sqrt{k^2 + 1}}{k^2 + 4}$$

$$= P(X \text{食達}) \cdot P(Y \text{食達})$$

未だ未だ

$$= \frac{(3k+3)}{k^2+4} \cdot \frac{3}{16}$$

$$= (\frac{3}{4})^2 \cdot \frac{1}{2} \cdot (\frac{3}{4})^3 \times 4$$

$$+ (\frac{3}{4})^4 \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{189}{2048}$$

$$\therefore r = \frac{3k+3}{k^2+4}$$

(2) ①を直線微分

$$r = \frac{13k}{k+3} \quad (k \geq 1)$$

② $x > 0$ で $\tilde{f}'(x) > 0$ が
 $\tilde{f}(x)$ は単調増加。
 $\therefore \tilde{f}(x) < 0$

(3)

$x > 0$ で $\tilde{f}'(x) > 0$ が
 $\tilde{f}(x)$ は単調増加。

C: $y = \tilde{f}(x)$
 C: $y = \tilde{f}(x-a) + \tilde{f}(a)$

$f(x) = \tilde{f}(x-a) + f(a) - \tilde{f}(a)$
 $f(x) = \tilde{f}(x-a) - \tilde{f}(a)$

$f(x) = 0 \Leftrightarrow x-a = -x$
 $\Leftrightarrow x = \frac{a}{2}$

\therefore
 (i) $x > \frac{a}{2}$ のとき
 $|x-a| < |x| \leq x$

$f(x) = \tilde{f}(x-a) - \tilde{f}(a) < 0$

(ii) $x < \frac{a}{2}$ のとき
 $|x-a| > |x| \text{ なので}$

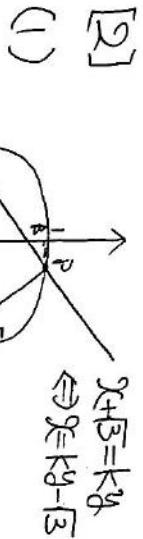
$f(x) = \tilde{f}(x-a) - \tilde{f}(a) > 0$

(2) ①を直線微分

$$-f'(-x) = -f'(x)$$

$\Leftrightarrow f'(-x) = f'(x)$
 ふて $f'(x)$ は偶数。

(2)



$$x+\beta = ky$$

$$\Leftrightarrow k = ky - \beta$$

$$\Leftrightarrow k^2 + \beta^2 = 1$$

$$\Leftrightarrow k^2 = 1 - \beta^2$$

$$\Leftrightarrow k = \pm \sqrt{1 - \beta^2}$$

$$\mathcal{J}(\alpha)$$

$$= \mathcal{J}''(\alpha)(\alpha + \mathcal{J}'(\alpha) - \mathcal{J}(\alpha))$$

$$= \mathcal{J}''(\alpha)\alpha > 0$$

れば $\mathcal{J}'(\alpha)$ は单調増加、

$$\begin{aligned} \mathcal{J}'(0) &= 0 \\ \alpha > 0 \text{ で } \mathcal{J}'(\alpha) &> 0 \end{aligned}$$

ゆえにこの範囲で $\mathcal{J}(\alpha)$ は单調増加、

$$0 < \alpha \leq 3 \text{ の } \frac{\partial}{\partial \alpha} \mathcal{J}(\alpha) = 3 > 0$$

(4) $\mathcal{J}(\alpha)$ の1つの値は実数を

$F(\alpha)$ とおこし

$$\mathcal{J}(\alpha)$$

$$= \int_0^\alpha g(x) dx$$

$$= [F(\alpha-\alpha) + \mathcal{J}(\alpha)\alpha - F(\alpha)]_0^\alpha$$

$$= F(0) + \mathcal{J}(\alpha)\alpha - F(\alpha)$$

$$- F(-\alpha) + F(0)$$

$$= \mathcal{J}(\alpha)\alpha - F(\alpha) - F(-\alpha) + 2F(0)$$

$$\mathcal{J}(\alpha)$$

$$= \mathcal{J}(0)\alpha + \mathcal{J}(\alpha) - \mathcal{J}(0)$$

$$- \mathcal{J}(-\alpha)(-1)$$

$$= \mathcal{J}(0)\alpha + \mathcal{J}(-\alpha)$$

$$= \mathcal{J}(-\alpha)\alpha - \mathcal{J}(\alpha)$$