第6回

[I].

[1].

$$\begin{cases} C_1: f(x)=2\sqrt{3}\sin\left(2x+\frac{\pi}{3}\right)+1 \\ C_2: g(x)=2\cos 2x \end{cases}$$

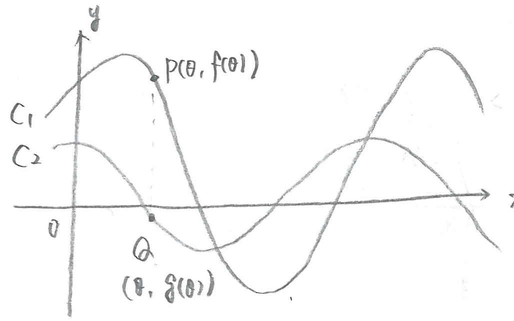
C_1: $f(x)=2\sqrt{3}\sin\left\{2\left(x+\frac{\pi}{6}\right)\right\}+1$.

より、$y=2\sqrt{3}\sin 2x$ を

x方向に $-\frac{\pi}{6}$: 2

y 〃 1 平行移動

$f(x)$の周期は π : 7



(1). $0\leqq\theta\leqq\pi$ で P と Q が一致する.

$f(\theta)=g(\theta)$ より.

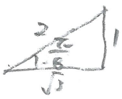
$2\sqrt{3}\sin\left(2\theta+\frac{\pi}{3}\right)+1=2\cos 2\theta$.

$2\sqrt{3}\left(\sin 2\theta\cdot\cos\frac{\pi}{3}+\cos 2\theta\cdot\sin\frac{\pi}{3}\right)+1=2\cos 2\theta$

$2\sqrt{3}\left(\frac{1}{2}\sin 2\theta+\frac{\sqrt{3}}{2}\cos 2\theta\right)+1=2\cos 2\theta$

$\sqrt{3}\sin 2\theta+3\cos 2\theta+1=2\cos 2\theta$

$\sqrt{3}\sin 2\theta+\cos 2\theta+1=0$



$2\sin\left(2\theta+\frac{\pi}{6}\right)+1=0$

$\sin\left(2\theta+\frac{\pi}{6}\right)=-\frac{1}{2}$

$2\theta+\frac{\pi}{6}=\frac{7}{6}\pi, \frac{11}{6}\pi$

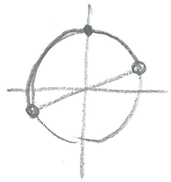
$2\theta=\pi, \frac{5}{3}\pi$

$\theta=\frac{\pi}{2}, \frac{5}{6}\pi$

(2). $0<\theta<\frac{\pi}{2}$ で PQの長さを考える.

$PQ=f(\theta)-g(\theta)$

$=2\sin\left(2\theta+\frac{\pi}{6}\right)+1$



$0<\theta<\frac{\pi}{2}$ より

$0<2\theta<\pi$, $\frac{\pi}{6}<2\theta+\frac{\pi}{6}<\frac{7}{6}\pi$

$-\frac{1}{2}<\sin\left(2\theta+\frac{\pi}{6}\right)\leqq 1$.

$-1<2\sin\left(2\theta+\frac{\pi}{6}\right)\leqq 2$

$0<2\sin\left(2\theta+\frac{\pi}{6}\right)+1\leqq 3$

よって.

$2\theta+\frac{\pi}{6}=\frac{\pi}{2}$, $2\theta=\frac{\pi}{3}$, $\theta=\frac{\pi}{6}$

のとき. PQの最大値は 3

[2]. $0\leqq x\leqq 4$.

$f(x)=\{\log_2(x^2-2x+2)\}^2-4\log_2(x^2-2x+2)^2+12$.

$x^2-2x+2=(x-1)^2-1+2=(x-1)^2+1$ より.

$x=4$のとき

$4^2-2\times4+2=16-8+2=10$.

$1\leqq x^2-2x+2\leqq 10$

$t=\log_2(x^2-2x+2)$ とすると.

$\log_2 1\leqq\log_2(x^2-2x+2)\leqq\log_2 10$.

$0\leqq t\leqq\log_2 2\cdot5=\log_2 2+\log_2 5$

$0\leqq t\leqq 1+\log_2 5$

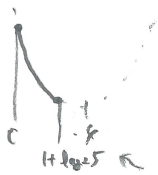
$f(x)=\{\log_2(x^2-2x+2)\}^2-8\log_2(x^2-2x+2)+12$

$=t^2-8t+12$

(1) $f(x)=t^2-8t+12$

$=(t-4)^2-16+12$

$=(t-4)^2-4$



($\log_2 5$ について考える)

$2^2<5<2^3$ より

$\log_2 2^2<\log_2 5<\log_2 2^3$

$2<\log_2 5<3$

$3<1+\log_2 5<4$

$t=0$ でグラフは最大となるので、

$x^2-2x+2=1$

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

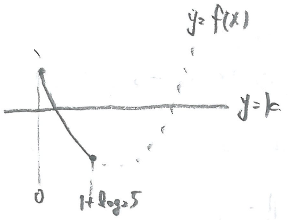
$(x-1)^2=0$

$x=1$ で、最大値

$f(x)=0^2-8\times 0+12=12$ です。

(2) $f(x)=k$ (k:整数) が $0\leqq x\leqq 4$ で実数解をもつときのk.

$f(x)=t^2-8t+12=k$ を考える。



$t=1+\log_2 5$ のときの最小値は

$y=(1+\log_2 5-4)^2-4$

$=(\log_2 5-3)^2-4$

$2<\log_2 5<3$ より

$-1<\log_2 5-3<0$

$0<(\log_2 5-3)^2<1$

$-4<(\log_2 5-3)^2-4<-3$

よって kの範囲は

$-3\leqq k\leqq 12$ となるので、

$12-(-3)+1=16$ 　16コ

最小のkは $k=-3$ となり

$f(x)=-3$ をとくと

$t^2-8t+12=-3$

$t^2-8t+15=0$

$(t-3)(t-5)=0$

$t=3,\ 5$

$0\leqq t\leqq 1+\log_2 5<4$ より

$t=3$

$\log_2(x^2-2x+2)=3$

$x^2-2x+2=2^3=8$

$x^2-2x-6=0$

$x=1\pm\sqrt{1+6}$

$=1\pm\sqrt{7}$

$0\leqq x\leqq 4$ より

$x=1+\sqrt{7}$ です。

$\boxed{2}$

$k > \frac{1}{2}$ をみたす実数.

$f(x) = 2x^3 - 3(2k+1)x^2 + 12kx + 1$

$f'(x) = 6x^2 - 6(2k+1)x + 12k$

$= 6\{x^2 - (2k+1)x + 2k\}$

$1 \quad 2k \quad -2k-1$
$\quad -2k \quad -2k$
$1 \quad -1 \quad -1$

$= 6(\underbrace{x-1}_{ア})(\underbrace{x-2k}_{イ})$

$k > \frac{1}{2}$ より $2k > 1$.

x	$\cdots$	1	$\cdots$	$2k$	$\cdots$
f'	$+$	0	$-$	0	$+$
f	↗	$f(1)$	↘	$f(2k)$	↗

$\boxed{極大値}$ $x = 1$.

$f(1) = 2 - 3(2k+1) + 12k + 1$

$= 2 - 6k - 3 + 12k + 1$

$= 6k$ ウ

$\boxed{極小値}$ $x = 2k$

$f(2k) = 16k^3 - 12k^2(2k+1) + 24k^2 + 1$

$= 16k^3 - 24k^3 - 12k^2 + 24k^2 + 1$

$= -8k^3 + 12k^2 + 1$ エ〜ク

$g(k) = -8k^3 + 12k^2 + 1$ とおくと

$g'(k) = -24k^2 + 24k$

$= -24k(k-1)$

k	$\cdots$	0	$\cdots$	$\frac{1}{2}$	$\cdots$	1	$\cdots$
g'	$-$	0	$+$		$+$	0	$-$
g	↘		↗		↗	大	↘

$k = 1$ ケ のとき 最大となり

最大値 $g(1) = -8 + 12 + 1 = 5$ コ

$k = 1$ とすると.

$f(x) = 2x^3 - 9x^2 + 12x + 1$

$f'(x) = 6(x-1)(x-2)$

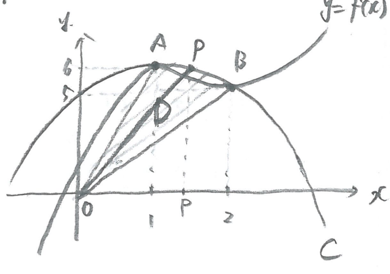
$x = 1$ サ で極大.

$x = 2$ シ で極小

x	$\cdots$	1	$\cdots$	2	$\cdots$
f'	$+$	0	$-$	0	$+$
f	↗	6	↘	5	↗

極大値 $6k$ より. $6 \times 1 = 6$.

小 $-8k^3 + 12k^2 + 1$ より. $-8 + 12 + 1 = 5$



$A(1, 6)$, $B(2, 5)$

A, B を通る放物線

$y = -x^2 + ax + b$

$\begin{cases} -1 + a + b = 6 \\ -4 + 2a + b = 5 \end{cases}$

$a + b = 7$

$-)\ 2a + b = 9$

$-a = -2$

$a = 2$ ス $\qquad 2 + b = 7 \qquad b = 5$ セ

$y = -x^2 + 2x + 5$

$= -(x-1)^2 + 1 + 5$

$C: y = -(x-1)^2 + 6$

$D = \frac{1}{2} \times 1 \times 6 + \int_1^2 (-x^2 + 2x + 5)dx - \frac{1}{2} \times 2 \times 5$

$= 3 + \left[-\frac{1}{3}x^3 + x^2 + 5x\right]_1^2 - 5$

$= 3 + \left\{-\frac{8}{3} + 4 + 10 - \left(-\frac{1}{3} + 1 + 5\right)\right\} - 5$

$= 3 - \frac{8}{3} + \cancel{4} + \cancel{10} + \frac{1}{3} - 1 - \cancel{5} - \cancel{5}$

$= 6 - \frac{7}{3} = \frac{18-7}{3} = \frac{11}{3}$ ソ〜チ

$\frac{D}{2} = \frac{1}{2} \times p \times (-p^2 + 2p + 5) + \int_p^2 (-x^2 + 2x + 5)dx - \frac{1}{2} \times 2 \times 5$

$= \frac{1}{2}(-p^3 + 2p^2 + 5p) + \left[-\frac{1}{3}x^3 + x^2 + 5x\right]_p^2 - 5$

$= \frac{1}{2}(-p^3 + 2p^2 + 5p) + \left\{-\frac{8}{3} + 4 + 10 - \left(-\frac{1}{3}p^3 + p^2 + 5p\right)\right\} - 5$

$= \frac{-3p^3 + \cancel{6p^2} + 15p + 2p^3 - \cancel{6p^2} - 30p}{6} - \frac{8}{3} + 9$

$= \frac{-p^3 - 15p}{6} + \frac{19}{3} = \frac{11}{3} \times \frac{1}{2} = \frac{11}{6}$

$-p^3 - 15p + 38 = 11$

$p^3 + 15p - 27 = 0$ ツテ

$p = 1$ のとき. $1 + 15 - 27 < 0$.

$p = \frac{5}{3}$ のとき $\frac{125}{27} + 25 - 27 > 0$

$p = \frac{4}{3}$ $\quad \frac{64}{27} + 20 - 27 < 0$

よって. $\frac{4}{3} < p < \frac{5}{3}$ $\quad 1$ ト

[3].

$a_n > 0$.

$a_1 = 1$. $a_{n+1} = \dfrac{2a_n}{4a_n+1}$ $(n=1,2,3,\cdots)$ —①

$$a_2 = \frac{2a_1}{4a_1+1} = \frac{2}{4+1} = \frac{2}{5} \text{ より、}$$

$$a_3 = \frac{2a_2}{4a_2+1} = \frac{2\times\frac{2}{5}}{4\times\frac{2}{5}+1} = \frac{\frac{4}{5}}{\frac{8}{5}+1}$$

$$= \frac{4}{8+5} = \frac{4}{13} \text{ 答.}$$

①の両辺を逆数にとると、

$$\frac{1}{a_{n+1}} = \frac{4a_n+1}{2a_n} = 2 + \frac{1}{2a_n}$$

$b_n = \dfrac{1}{a_n}$ とおくと.

$$b_{n+1} = \frac{1}{2}b_n + 2. \text{ かつ}$$

特性方程式より

$$x = \frac{1}{2}x + 2.$$

$$\frac{1}{2}x = 2. \quad x = 4$$

$$b_{n+1} - 4 = \frac{1}{2}(b_n - 4)$$

$$b_1 = \frac{1}{a_1} = \frac{1}{1} = 1, \text{ より}$$

$\{b_n - 4\}$ は、初項 $b_1 - 4 = 1 - 4 = -3$ 公比 $\frac{1}{2}$ の等比数列となる.

よって.

$$b_n - 4 = -3\cdot\left(\frac{1}{2}\right)^{n-1}$$

$$b_n = 4 - \frac{3}{2^{n-1}} \text{ より.}$$

$$= \frac{4\cdot 2^{n-1} - 3}{2^{n-1}} = \frac{2^{n+1}-3}{2^{n-1}}$$

よって. $b_n = \dfrac{1}{a_n}$ より

$$a_n = \frac{1}{b_n} = \frac{2^{n-1}}{2^{n+1}-3}$$

(1). $a_n < \dfrac{251}{1000}$ をみたす最小のnは

$$\frac{2^{n-1}}{2^{n+1}-3} < \frac{251}{1000}$$

$$1000\cdot 2^{n-1} < 251(2^{n+1}-3)$$

$$10^3\cdot 2^{n-1} < (250+1)(2^{n+1}-3)$$

$$(2\cdot 5)^3\cdot 2^{n-1} < (2\cdot 5^3+1)(2^{n+1}-3)$$

$$\cancel{5^3\cdot 2^{n+2}} < \cancel{5^3\cdot 2^{n+2}} - 2\cdot 3\cdot 5^3 + 2^{n+1} - 3$$

$$2^{n+1} > 2\cdot 3\cdot 5^3 + 3 = 3(2\cdot 5^3 + 1)$$

$$= 3\times 251 = 753.$$

$2^{10} = 1024$, $2^9 = 512$ より.

$$2^9 < 753 < 2^{10}.$$

よって. $2^{n+1} > 753$ となる最小のnは

$n+1 = 10$. $n = 9$. 答.

(2). $$\sum_{k=1}^{n} b_k = \sum_{k=1}^{n}\left(4 - \frac{3}{2^{k-1}}\right) = 4n - 3\sum_{k=1}^{n}\left(\frac{1}{2}\right)^{k-1}$$

$$= 4n - 3\cdot\frac{1-\left(\frac{1}{2}\right)^n}{1-\frac{1}{2}} = 4n - 6\left\{1 - \left(\frac{1}{2}\right)^n\right\}$$

$$= 4n - 6 + 3\cdot\frac{2}{2^n} = 4n - 6 + \frac{3}{2^{n-1}} \text{ 答.}$$

$\{c_n\}$ について. $c_1 = 1$, $c_{n+1} = c_n + b_n$

$c_{n+1} - c_n = b_n$ より.

$$c_n = c_1 + \sum_{k=1}^{n-1} b_k = 1 + \left\{4(n-1) - 6 + \frac{3}{2^{(n-1)-1}}\right\}$$

$$= 1 + 4n - 4 - 6 + \frac{3}{2^{n-2}}$$

$$= 4n - 9 + \frac{3}{2^{n-2}} \text{ 答}$$

$\boxed{3}$ (つづき)

$$\sum_{k=1}^{2n}(-1)^k C_k$$

$$= (-1)^1 \cdot C_1 + (-1)^2 \cdot C_2 + (-1)^3 \cdot C_3 + (-1)^4 \cdot C_4$$

$$+ \cdots + (-1)^{n-1} C_{n-1} + (-1)^n \cdot C_n + \cdots$$

$$\cdots + (-1)^{2n-1} \cdot C_{2n-1} + (-1)^{2n} \cdot C_{2n}$$

$$= -C_1 + C_2 - C_3 + C_4 - \cdots - C_{2n-1} + C_{2n}.$$

$$= (C_2 + C_4 + \cdots + C_{2n}) - (C_1 + C_3 + \cdots + C_{2n-1})$$

$$= \sum_{m=1}^{n} C_{2m} - \sum_{m=1}^{n} C_{2m-1}$$

- $$\sum_{m=1}^{n} C_{2m} = \sum_{m=1}^{n}\left(4 \cdot 2m - 9 + \frac{3}{2^{2m-2}}\right)$$

$$= \sum_{m=1}^{n}\left(8m - 9 + \frac{3}{4^{m-1}}\right)$$

$$= \cancelto{4}{8} \cdot \frac{n(n+1)}{\cancel{2}} - 9n + 3 \cdot \frac{1-\left(\frac{1}{4}\right)^n}{1-\frac{1}{4}}$$

$$= 4n^2 + 4n - 9n + \cancel{3} \cdot \frac{4}{\cancel{3}} \left\{1 - \left(\frac{1}{4}\right)^n\right\}$$

$$= 4n^2 - 5n + 4 - \frac{1}{4^{n-1}}$$

- $$\sum_{m=1}^{n} C_{2m-1} = \sum_{m=1}^{n}\left\{4 \cdot (2m-1) - 9 + \frac{3}{2^{2m-1-2}}\right\}$$

$$= \sum_{m=1}^{n}\left(8m - 4 - 9 + \frac{3}{2^{2m-3}}\right)$$

$$= \sum_{m=1}^{n}\left(8m - 13 + \frac{3}{2^{2(m-1)} \cdot 2^{-1}}\right)$$

$$= \sum_{m=1}^{n}\left(8m - 13 + \frac{6}{4^{m-1}}\right)$$

$$= \cancelto{4}{8} \cdot \frac{n(n+1)}{\cancel{2}} - 13n + 6 \cdot \frac{1-\left(\frac{1}{4}\right)^n}{1-\frac{1}{4}}$$

$$= 4n^2 + 4n - 13n + \cancelto{2}{6} \cdot \frac{4}{\cancel{3}} \cdot \left\{1 - \left(\frac{1}{4}\right)^n\right\}$$

$$= 4n^2 - 9n + 8 - \frac{2}{4^{n-1}}$$

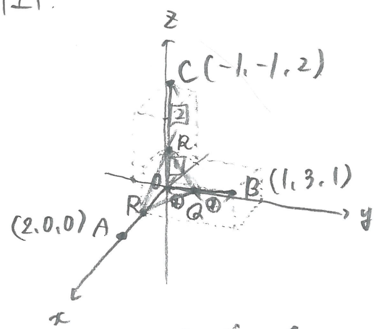
よって.

$$\sum_{k=1}^{2n}(-1)^k C_k$$

$$= \cancel{4n^2} - 5n + 4 - \frac{1}{4^{n-1}} - \left(\cancel{4n^2} - 9n + 8 - \frac{2}{4^{n-1}}\right)$$

$$= \underline{4n - 4 + \frac{1}{4^{n-1}}}$$ …答.

$\boxed{4}$.



△PQRの重心G.

PはOAの中点.

$P(1, 0, 0)$ ア

QはOBを2:1に内分.

$Q\left(\dfrac{2}{3}, 2, \dfrac{2}{3}\right)$ イ〜エ

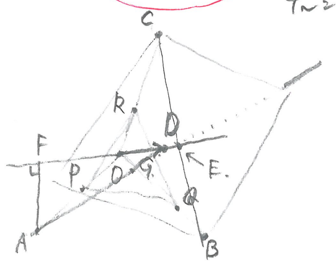
RはOCを1:2に内分.

$R\left(-\dfrac{1}{3}, -\dfrac{1}{3}, \dfrac{2}{3}\right)$ オ〜ク.

Gは△PQRの重心.

$G\left(\dfrac{1+\frac{2}{3}-\frac{1}{3}}{3}, \dfrac{2-\frac{1}{3}}{3}, \dfrac{\frac{2}{3}+\frac{2}{3}}{3}\right)$

$= G\left(\dfrac{4}{9}, \dfrac{5}{9}, \dfrac{4}{9}\right)$ ケ〜サ.



$$\begin{cases} \overrightarrow{OD} = \overrightarrow{OA} + t\overrightarrow{AG} & \text{— ①} \\ \overrightarrow{OD} = \alpha\overrightarrow{OB} + \beta\overrightarrow{OC} & \text{— ②} \end{cases}$$

①より.

$\overrightarrow{OD} = \overrightarrow{OA} + t(-\overrightarrow{OA} + \overrightarrow{OG})$

$= (1-t)\overrightarrow{OA} + t\overrightarrow{OG}$

$= (1-t)(2, 0, 0) + t\left(\dfrac{4}{9}, \dfrac{5}{9}, \dfrac{4}{9}\right)$

$= \left(2-2t+\dfrac{4}{9}t, \dfrac{5}{9}t, \dfrac{4}{9}t\right)$

$\overrightarrow{OD} = \left(2-\dfrac{14}{9}t, \dfrac{5}{9}t, \dfrac{4}{9}t\right)$

②より

$\overrightarrow{OD} = \alpha(1, 3, 1) + \beta(-1, -1, 2)$

$= (\alpha-\beta, 3\alpha-\beta, \alpha+2\beta)$

ここから.

$$\begin{cases} 2-\dfrac{14}{9}t = \alpha-\beta & \text{— ③} \\ \dfrac{5}{9}t = 3\alpha-\beta & \text{— ④} \\ \dfrac{4}{9}t = \alpha+2\beta & \text{— ⑤} \end{cases}$$

がえられる。

これをとく

④ − ③

$\dfrac{5}{9}t = 3\alpha-\beta.$

$-)\ 2-\dfrac{14}{9}t = \alpha-\beta$

$-2+\dfrac{19}{9}t = 2\alpha.$

$-1+\dfrac{19}{18}t = \alpha.$

⑤ + ③ × 2

$\dfrac{4}{9}t = \alpha+2\beta$

$+)\ 4-\dfrac{28}{9}t = 2\alpha-2\beta$

$4-\dfrac{24}{9}t = 3\alpha$

$\dfrac{4}{3}-\dfrac{8}{9}t = \alpha.$

$-1+\dfrac{19}{18}t = \dfrac{4}{3}-\dfrac{8}{9}t.$

$-18+19t = 24-16t.$

$35t = 42.$

$t = \dfrac{6}{5}$ スセ.

$\alpha = -1+\dfrac{19}{\cancel{18}_3}\times\dfrac{\cancel{6}^1}{5} = -\dfrac{15}{15}+\dfrac{19}{15} = \dfrac{4}{15}$ ソ〜チ

④より

$\beta = 3\times\dfrac{4}{15}-\dfrac{5}{\cancel{9}_3}\times\dfrac{\cancel{6}^2}{5} = \dfrac{12-10}{15} = \dfrac{2}{15}$ ツ

②より. $\overrightarrow{OD} = \dfrac{4}{15}\overrightarrow{OB} + \dfrac{2}{15}\overrightarrow{OC}$

$\overrightarrow{OE} = k\overrightarrow{OD} = \dfrac{4}{15}k\overrightarrow{OB} + \dfrac{2}{15}k\overrightarrow{OC}$

EはBC上の点より. $\dfrac{4}{15}k + \dfrac{2}{15}k = 1.$

$\dfrac{\cancel{6}^2}{\cancel{15}_5}k = 1.$ $k = \dfrac{5}{2}$ $\overrightarrow{OE} = \dfrac{5}{2}\overrightarrow{OD}$

$\dfrac{|\overrightarrow{OE}|}{|\overrightarrow{OD}|} = \dfrac{5}{2}$ OD : OE : DE = 2 : 5 : 3 テ

$\overrightarrow{OE} = \dfrac{\cancel{5}^1}{\cancel{2}_1}\left(\dfrac{\cancel{4}^2}{\cancel{15}_3}\overrightarrow{OB} + \dfrac{\cancel{2}^1}{\cancel{15}_3}\overrightarrow{OC}\right) = \dfrac{2}{3}\overrightarrow{OB} + \dfrac{1}{3}\overrightarrow{OC}$

BE : EC = 1 : 2 ト

FはOD上にある点なので. $\overrightarrow{AF} \perp \overrightarrow{OD}$ となるから.

$\overrightarrow{AF} \cdot \overrightarrow{OD} = 0.$

②より. $\overrightarrow{OD} = \left(\dfrac{4}{15}-\dfrac{2}{15}, 3\times\dfrac{4}{15}-\dfrac{2}{15}, \dfrac{4}{15}+2\times\dfrac{2}{15}\right)$

$= \left(\dfrac{2}{15}, \dfrac{10}{15}, \dfrac{8}{15}\right) = \left(\dfrac{2}{15}, \dfrac{2}{3}, \dfrac{8}{15}\right)$

$\overrightarrow{OF} = s\overrightarrow{OD}$

$= s\left(\frac{2}{15}, \frac{2}{3}, \frac{8}{15}\right) = \left(\frac{2}{15}s, \frac{2}{3}s, \frac{8}{15}s\right)$

$\overrightarrow{AF} = -\overrightarrow{OA} + \overrightarrow{OF}$

$= \left(\frac{2}{15}s - 2, \frac{2}{3}s, \frac{8}{15}s\right)$

$\begin{array}{r} 15 \\ \times 15 \\ \hline 75 \\ 15 \\ \hline 225 \end{array}$

$\overrightarrow{AF} \cdot \overrightarrow{OD} = 0$ より.

$\left(\frac{2}{15}s - 2, \frac{2}{3}s, \frac{8}{15}s\right) \cdot \left(\frac{2}{15}, \frac{2}{3}, \frac{8}{15}\right) = 0$

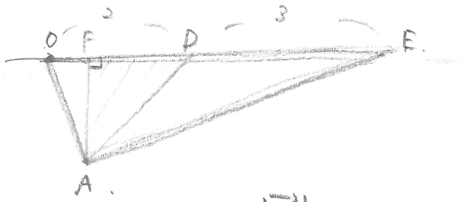
$\frac{4}{225}s - \frac{4}{15} + \frac{4}{9}s + \frac{64}{225}s = 0$

$4s - 60 + 100s + 64s = 0$

$\underset{42,\ 14}{\cancel{168}}\,s = \underset{15,\ 5}{\cancel{60}} \qquad s = \frac{5}{14}.$

$F\left(\frac{2}{15} \times \frac{5}{14}, \frac{2}{3} \times \frac{5}{14}, \frac{8}{15} \times \frac{5}{14}\right)$

$= \underline{\left(\frac{1}{21}, \frac{5}{21}, \frac{4}{21}\right)}$ ト～1.



$\overrightarrow{OF} = \frac{5}{14}\overrightarrow{OD}$ より $\frac{|\overrightarrow{OF}|}{|\overrightarrow{OD}|} = \frac{5}{14}$

$OD : OF : \underline{FD} = 14 : 5 : 9$

$OD : \underline{OE} = 2 : 5 = 14 : \underline{35}$

$FD : OE = 9 : 35.$

$\triangle ADF : \triangle OAE = 9 : 35.$

$35\triangle ADF = 9\triangle OAE$

$\triangle ADF = \frac{9}{35}\triangle OAE$

$\underline{\frac{9}{35}倍.}$ ハ～フ.