

2017 北里医

$$= \frac{4}{(\sin\theta + i\cos\theta)^3 + 3[(\sin\theta + i\cos\theta)^2 - 1]} - 9x$$

(1) $\text{商} \cdots Q(x) \times R(x)$.

$$x^3 - 4x^2 + 9x + b = (x-1)R(x) + 1$$

$$\downarrow x = 1 \text{ を代入}$$

$$-3 + a + b = 1$$

$$\Leftrightarrow b = -a + 4$$

$$x^3 - 4x^2 + 9x - 9$$

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

$$= 3(x+3)(x-1)$$

$$\downarrow \text{微分}$$

(2)

$\forall (a, b) \in Q(x) \times R(x)$

$$-5 + a = 0$$

$$\therefore a = 5, b = -1$$

$$\begin{cases} (a+3)^2 + (b-6)^2 = (a-5)^2 + b^2 \\ (a+5)^2 + b^2 = (a-4)^2 + (b-7)^2 \end{cases}$$

$$x = \sqrt{2} \sin(\theta + \frac{\pi}{4})$$

$$\frac{\pi}{2} \leq \theta + \frac{\pi}{4} \leq \frac{5\pi}{4} \quad \text{すなはち}$$

$$-\frac{\pi}{4} \leq x \leq \sqrt{2}$$

$$\frac{\partial \phi}{\partial x} = \frac{1}{2}, \quad \frac{\partial \phi}{\partial y} = \frac{1}{2}$$

(5)

$$z^4 = 16 \left(-\frac{1}{2} + \frac{\sqrt{3}}{2}i \right)$$

$$= 16 \left(\cos \frac{2}{3}\pi + i \sin \frac{2}{3}\pi \right)$$

$$z = r (\cos \theta + i \sin \theta)$$

$$\left(\frac{2}{3}\pi < \theta < 2\pi \right)$$

すなはち

$$z^4 = r^4 (\cos 4\theta + i \sin 4\theta)$$

$$(6\pi < 4\theta < 8\pi)$$

$$\Rightarrow r = 2, \quad 4\theta = \frac{2}{3}\pi + 6\pi$$

$$\therefore \theta = \frac{5}{3}\pi$$

(4)

$$\begin{array}{c} \text{微分} \\ \text{おも} \\ Q_n \xrightarrow{\frac{2}{3}} Q_{n+1} \\ 1-Q_n \xrightarrow{\frac{1}{6}} Q_{n+1} \end{array}$$

$$Q_{n+1} = \frac{2}{3}Q_n + \frac{1}{6}(1-Q_n)$$

$$= \frac{1}{2}Q_n + \frac{1}{6}$$

$$W = \frac{1}{2}Z$$

$$= \cos \frac{5}{3}\pi + i \sin \frac{5}{3}\pi$$

$$= \cos \left(-\frac{5}{3}\pi \right) + i \sin \left(-\frac{5}{3}\pi \right)$$

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

$$\therefore Q_n = \frac{1}{3} \left(\frac{1}{2} \right)^{n-1} + \frac{1}{3}$$

$$6) \frac{336}{\frac{18}{\frac{21}{\frac{35}{36}}}}$$

[2]

(1)

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

$$\left(\begin{array}{l} 0 = b + C \\ 0 = b + C \end{array} \right)$$

$$W^{2017} = \cos\left(-\frac{2017}{3}\pi\right) + i\sin\left(-\frac{2017}{3}\pi\right)$$

$$= \cos\left(-\frac{35.6+1}{3}\pi\right)$$

$$+ i\sin\left(-\frac{35.6+1}{3}\pi\right)$$

$$= \cos\left(-\frac{\pi}{3}\right) + i\sin\left(-\frac{\pi}{3}\right)$$

$$(W)^{2017} = \cos\frac{\pi}{3} + i\sin\frac{\pi}{3}$$

$$\therefore W^{2017} + (W)^{2017} = 1$$

$$+ x^2 + x^3 + x^4$$

$$= \frac{1-x^4}{1-x}$$

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

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

$$= \frac{1-x^4}{\sqrt{3}i} + x^4$$

$$= \left(1+\frac{i}{\sqrt{3}}\right)(-8+\sqrt{3}i) - \frac{1}{\sqrt{3}}$$

$$= -(6+\sqrt{3}i) - \frac{8i}{\sqrt{3}} - \frac{1}{\sqrt{3}}$$

$$= -16 + 5\sqrt{3}i$$

$\Im(\alpha) > 0$.

$\therefore b(x^2-2x) - 2x\sqrt{x} > 0$.

$$\frac{4\sqrt{a}(a+3)}{15(a-a)} = \frac{8\sqrt{a}}{3(a-a)}$$

$$\Leftrightarrow \frac{5}{5+3a^2-10} = 2$$

$$S = \int_0^a [b(x^2-2x) - 2x\sqrt{x}] dx$$

$$= \int_0^a \left[b\left(\frac{x^3}{3} - x^2\right) - \frac{4}{5}x^{\frac{5}{2}} \right] dx$$

$$= b\left(\frac{x^3}{3} - x^2\right) - \frac{4}{5}x^{\frac{5}{2}}$$

$$= \frac{a^2}{15} \left\{ b(5a-15) - 12\sqrt{a} \right\}$$

$$= \frac{20\sqrt{a}}{15} \left(\frac{5a-15}{a-2} - 6 \right)$$

$$g'(a) = 30a^2 + 6a > 0 \quad (0 < a < 2)$$

$$g(a) \text{ は単調増加}.$$

$$g(0) < 0, g(2) > 0 \therefore$$

$$g(a) = 0 \text{ かつ } 0 \text{ は左端} \Rightarrow$$

左端(左端)で極値(左端)となる。

(3)

$$\int_C^T$$

○

補足: 公式の展開では(2)で

$$b(x^2-2x) > 2x\sqrt{x}$$

これは(2)で(左端)、(左端)

左端で書き換えていますね。

$$T = \int_0^2 b(x-2) dx$$

$$= b \left[\frac{1}{2}t^2 - 2t \right]_0^2$$

$$= -\frac{4}{3} \cdot \frac{\sqrt{a}}{a-2}$$

$$= \frac{8\sqrt{a}}{3(2-a)}$$

[3]

$$(i) \sqrt{3}x+y \geq 0, \sqrt{3}x-y \geq 0 \text{ のとき}$$

$$\vec{x}+\vec{y}-\sqrt{3}\vec{x}=0$$

$$\Leftrightarrow (\vec{x}-\sqrt{3})^2+\vec{y}^2=3$$

$$(ii) \sqrt{3}x+\vec{y} \geq 0, \sqrt{3}x-\vec{y} < 0 \text{ のとき}$$

$$\vec{x}+\vec{y}-\sqrt{3}\vec{x}=0$$

$$\Leftrightarrow (\vec{x}-\sqrt{3})^2+\vec{y}^2=3$$

$$(iii) \sqrt{3}x+\vec{y} < 0, \sqrt{3}x-\vec{y} \geq 0 \text{ のとき}$$

$$\begin{cases} \vec{y} < -\sqrt{3}\vec{x} \\ \vec{y} \leq \sqrt{3}\vec{x} \end{cases}$$

$$\text{これがこの領域は } \vec{y} \leq 0 \text{ の} \\ \text{領域にある。}$$

$$(iv) \sqrt{3}x+\vec{y} < 0, \sqrt{3}x-\vec{y} < 0 \text{ のとき}$$

$$\vec{x}+\vec{y}+\sqrt{3}\vec{x}=0$$

$$\Leftrightarrow (\vec{x}+\sqrt{3})^2+\vec{y}^2=3$$

$$\vec{y}=-\sqrt{3}\vec{x}$$

$$\frac{3}{2} < b < \sqrt{3}$$

$$\vec{x}^2 + \vec{y}^2 - 2\vec{y} = 0$$



$$\frac{3}{2} < b < \sqrt{3}$$

bの範囲は図より

$$\frac{3}{2} < b < \sqrt{3}$$

$$\Leftrightarrow a > -\frac{3-b^2}{2\sqrt{3}b}$$

$$(i) \frac{3+2\sqrt{6}}{5} \leq b < \sqrt{3} \text{ のとき}$$

$$g(b)-5gb = \frac{3-b^2}{\sqrt{3}b} = k(b)$$

$$k(b) = -\frac{\sqrt{3}}{b^2} - \frac{1}{b^3} < 0$$

$$g(b)-5gb \text{ は単調減少。}$$

$$0 < \frac{3-b^2}{2\sqrt{3}b}.$$

$$\text{(以上より)条件は}$$

$$\begin{cases} -\frac{3b^3}{\sqrt{3}} < a < \frac{3b^3}{\sqrt{3}} \\ -\frac{3b^2}{2\sqrt{3}b} < a < \frac{3-b^2}{2\sqrt{3}b} \end{cases}$$

$$g(b)-5gb \text{ が最大。}$$

$$P(b) = \frac{2b^3}{\sqrt{3}} - \frac{3-b^2}{2\sqrt{3}b}$$

$$= \frac{4b^2-6b-3+b^2}{2\sqrt{3}b}$$

$$= \frac{5b^2-6b-3}{2\sqrt{3}b}$$

$$\text{とおく}$$

$$\frac{3}{2} < b < \frac{3+2\sqrt{6}}{5} \text{ のとき } P(b) < 0.$$

$$\frac{3+2\sqrt{6}}{5} \leq b < \sqrt{3} \text{ のとき } P(b) \geq 0.$$

$$\text{以上より}$$

$$(i) \frac{3}{2} < b < \frac{3+2\sqrt{6}}{5} \text{ のとき}$$

$$g(b)-5gb = \frac{2b^3-3}{\sqrt{3}}$$

$$\text{の実数解は单調増加。}$$