2016 金沢医科

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(1)

$-1 \leqq x \leqq -\frac{1}{3}$

$\Leftrightarrow (x+1)(x+\frac{1}{3}) \leqq 0$

$\Leftrightarrow \underline{3}x^2+\underline{4}x+\underline{1} \leqq 0$

$P(a=3,\ b=4,\ c=1)$

$= {}_4C_3\left(\frac{1}{2}\right)^4 \cdot \frac{1}{6}$

$= \underline{\frac{1}{24}}$

(2)

$a+c=4$.

$a=0,1,3,4$ では $x=k$ が解にならない。

$2x^2+4x+2 \leqq 0$

$\Leftrightarrow 2(x+1)^2 \leqq 0$

であることより、$x=k=\underline{-1}$

$P(k=-1)$

$= {}_4C_2\left(\frac{1}{2}\right)^4 \frac{1}{6} = \underline{\frac{1}{16}}$

(3) $D=b^2-4ac<0$

$\Leftrightarrow b^2<4a(4-a)$

$(a,b)=(1,\ 1\leqq b\leqq 3),$

$(2,\ 1\leqq b\leqq 3),$

$(3,\ 1\leqq b\leqq 3),$

より

$P(D<0)$

$= {}_4C_1\left(\frac{1}{2}\right)^4\frac{3}{6} + {}_4C_2\left(\frac{1}{2}\right)^4\frac{3}{6}$

$+ {}_4C_3\left(\frac{1}{2}\right)^4\frac{3}{6}$

$= \underline{\frac{7}{16}}$

(4) $x=-3$ のとき

$P(9a-3b+c \leqq 0)$

$= P(8a-3b+4 \leqq 0)$

$= P(8a \leqq 3b-4)$

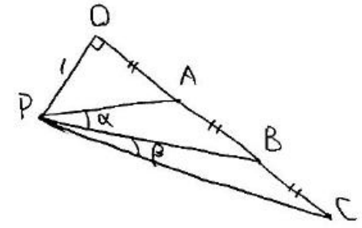
$= P\big((a,b)=(0,\ 2\leqq b\leqq 6),$

$(1,\ 4\leqq b\leqq 6)\big)$

$= \left(\frac{1}{2}\right)^4\frac{5}{6} + {}_4C_1\left(\frac{1}{2}\right)^4\frac{3}{6}$

$= \frac{5+12}{96} = \underline{\frac{17}{96}}$

2



余

$\cos\alpha = \frac{2+5-1^2}{2\sqrt{2}\cdot\sqrt{5}} = \underline{\frac{3}{\sqrt{10}}}$

$\cos\beta = \frac{5+10-1^2}{2\sqrt{5}\cdot\sqrt{10}} = \underline{\frac{7}{5\sqrt{2}}}$

$\cos 2\beta = 2\cos^2\beta - 1$

$= \frac{49}{25} - 1 = \underline{\frac{24}{25}}$

$\cos\alpha - \cos 2\beta$

$= 3\left(\frac{1}{\sqrt{10}} - \frac{8}{25}\right)$

$= 3\left(\frac{1}{\sqrt{10}} - \frac{1}{\frac{25}{8}}\right)$

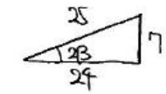
$<0 \quad (\because \underset{3.1622\cdots}{\sqrt{10}} > \underset{3.125}{\frac{25}{8}})$

$8\overline{)25}$ = 3.125; 24, 10, 8, 20, 16

$\therefore \underline{\cos\alpha < \cos 2\beta}$

$\therefore \underline{\alpha > 2\beta}$

$\tan\left(\frac{\pi}{4}+2\beta\right)$



$= \frac{1+\tan 2\beta}{1-1\cdot\tan 2\beta}$

$= \frac{1+\frac{7}{24}}{1-\frac{7}{24}}$

$= \underline{\frac{31}{17}} = \tan\angle OPQ$

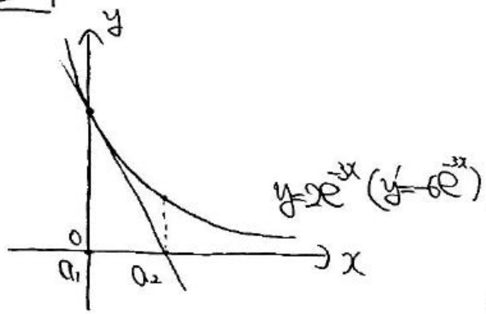
これより

$OQ = \frac{31}{17}$

$QB = OB - OQ$

$= 2 - \frac{31}{17} = \underline{\frac{3}{17}}$

$\boxed{3}$



$B_n(a_n, 2e^{-3a_n})$での接線は

$y = -6e^{-3a_n}(x - a_n) + 2e^{-3a_n}$

$= -6e^{-3a_n}x + e^{-3a_n}(6a_n + 2)$

$\downarrow$ $(a_{n+1}, 0)$通過

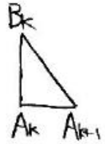
$0 = -6e^{-3a_n}a_{n+1} + e^{-3a_n}(6a_n + 2)$

$\Leftrightarrow a_{n+1} = a_n + \frac{1}{3}$

$\Leftrightarrow a_{n+1} - a_n = \frac{1}{3}$ //

$\therefore a_n = a_1 + (n-1)\frac{1}{3} = \frac{n-1}{3}$ //

S_n

$= \sum_{k=1}^{n}$ 

$= \sum_{k=1}^{n} \frac{1}{3} \cdot 2e^{-3a_k} \cdot \frac{1}{2}$

$= \sum_{k=1}^{n} \frac{1}{3} e^{-k+1}$

$\lim_{n \to \infty} S_n = \frac{\frac{1}{3}}{1 - e^{-1}} = \frac{e}{3(e-1)}$ //

T_n

$= \int_0^{a_{n+1}} 2e^{-3x}\,dx$

$= \left[-\frac{2}{3}e^{-3x}\right]_0^{a_{n+1}}$

$= \frac{2}{3} - \frac{2}{3}e^{-n}$

$\frac{T_n}{S_n}$

$= \frac{\frac{2}{3} - \frac{2}{3}e^{-n}}{\frac{\frac{1}{3} - \frac{1}{3}e^{-n}}{1 - e^{-1}}} = 2(1 - e^{-1})$ //

$\boxed{4}$

$C: (y-3)^2 = -2x + 9$

$\Leftrightarrow \underbrace{(y-3)}_{Y}{}^2 = -2\left(x - \frac{9}{2}\right)$

$= 4\left(-\frac{1}{2}\right)\underbrace{\left(x - \frac{9}{2}\right)}_{X}$

焦点 $(X, Y) = \left(-\frac{1}{2}, 0\right)$

$(x, y) = (4, 3)$ //

$y^2 = 10x$ と $y^2 + 2x - 6y = 0$ を連立.

$5y^2 + y^2 - 30y = 0$

$\Leftrightarrow y(y-5) = 0$

$\therefore Q\left(\frac{5}{2}, 5\right)$ //

$PQ: y = \frac{-2}{\frac{3}{2}}(x - 4) + 3$

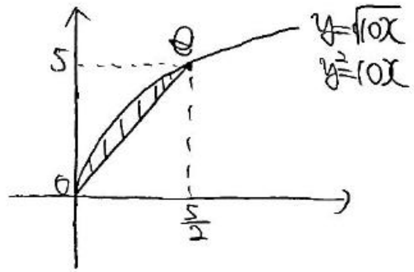
$= -\frac{4}{3}x + \frac{16}{3} + 3$

$= -\frac{4}{3}x + \frac{25}{3}$

$\Leftrightarrow 4x + 3y - 25 = 0$ //

$\triangle OPQ$

$= \frac{1}{2}\left|4 \cdot 5 - 3 \cdot \frac{5}{2}\right| = \frac{25}{4}$ //



(体積)

$= \frac{25}{4}\pi \cdot 5 \cdot \frac{1}{3}$

$- \int_0^5 \underbrace{x^2}_{\frac{1}{100}y^4} \pi\,dy$

$= \frac{125}{12}\pi - \left[\frac{1}{500}y^5\right]_0^5 \pi$

$= \frac{125}{12}\pi - \frac{25}{4}\pi = \frac{25}{6}\pi$ //