

2014 東海大(医) 旧 2 期

11

(1)

$$(x-5)^2 + (y+2)^2 = 169$$

中心 $(5, -2)$ 半径 13

(2)

$$\cos \theta = \frac{3}{4} \quad \sin \theta = \frac{\sqrt{7}}{4}$$

$$\cos 2\theta = 2\left(\frac{3}{4}\right)^2 - 1 = -\frac{1}{8}$$

$$\sin^2 \frac{\theta}{2} = \frac{1}{2} \left(1 - \frac{3}{4}\right) = \frac{1}{8}$$

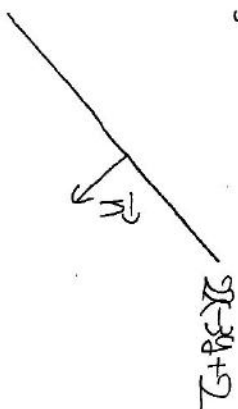
$$\therefore \sin \frac{\theta}{2} = \frac{\sqrt{2}}{4}$$

(3)

$$\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \theta$$

$$\therefore \cos \theta = \frac{1}{4}$$

(4)



$\vec{n} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ が方向ベクトル

(7.14) を通る直線は

$$\begin{cases} x = 2t + 1 \\ y = -3t + 4 \end{cases}$$

$2x - 3y + 2 = 0$ を満たす

$$4t + 14 + 9t - 12 + 2 = 0$$

$$\Leftrightarrow 13t = 26 \quad \therefore t = 2$$

点 $(11, 8)$

特異点 $(15, 2)$

(5)

$$l_{y=2}$$

$$= 85 \times l_{y=2} = 95.585$$

$$25 < l_{y=2} < 26$$

$$\Leftrightarrow 10^{25} < 2^{25} < 10^{26}$$

$$\therefore 26 \text{ bit}$$

2

(1)

$$P(\text{国産車})$$

$$= 1 \cdot \frac{5}{6} = \frac{5}{6}$$

$$P(\text{国産車})$$

$$= 1 \cdot \frac{1}{6} \cdot \frac{5}{6} = \frac{5}{36}$$

(2) $X \sim Y$

$$P(X \equiv N)$$

$$= P(X=N) + P(X=N+1)$$

$$= P(N-1 \text{ 回連続目})$$

$$+ P(N \text{ 回連続目})$$

$$= 1 \cdot \left(\frac{1}{6}\right)^{N-2} \cdot \frac{5}{6} + 1 \cdot \left(\frac{1}{6}\right)^{N-1}$$

$$= \left(\frac{5}{6} + \frac{1}{6}\right) \left(\frac{1}{6}\right)^{N-2} = \left(\frac{1}{6}\right)^{N-2}$$

(3) $N=30$ のとき

$$E(X)$$

$$= \sum_{k=2}^N k P(X=k)$$

$$= 2 \cdot \frac{5}{6} + 3 \cdot \frac{5}{36} + 4 \cdot \left(\frac{1}{6}\right)^2$$

$$= \frac{60 + 15 + 4}{36} = \frac{79}{36}$$

(4)

$$P(X=1)$$

$$= 1 \cdot \left(\frac{1}{6}\right)^{N-2} \cdot \frac{5}{6}$$

$$= 30 \left(\frac{1}{6}\right)^N$$

$$G_N$$

$$= \sum_{k=2}^N k P(X=k)$$

$$= \sum_{k=2}^N k P(X=k) + (N+1) P(X=N+1)$$

$$= S_N + (N+1) \left(\frac{1}{6}\right)^{N+1}$$

$$S_N = 60 \left(\frac{1}{6}\right)^2 + 90 \left(\frac{1}{6}\right)^3 + \dots + 30N \left(\frac{1}{6}\right)^N$$

$$\frac{1}{6} S_N = 60 \left(\frac{1}{6}\right)^3 + \dots + 30N \left(\frac{1}{6}\right)^N$$

$$\frac{1}{6} S_N = \frac{60}{6} + 30 \frac{\left(\frac{1}{6}\right)^3 - \left(\frac{1}{6}\right)^{N+1}}{1 - \frac{1}{6}} - 30N \left(\frac{1}{6}\right)^N$$

$$= \frac{5}{3} + 36 \left[\left(\frac{1}{6}\right)^3 - \left(\frac{1}{6}\right)^{N+1}\right] - 30N \left(\frac{1}{6}\right)^N$$

$$S_N = 2 + \frac{5}{3} \left[\left(\frac{1}{6}\right)^3 - \left(\frac{1}{6}\right)^{N+1}\right] - 30N \left(\frac{1}{6}\right)^N$$

$$= \frac{11}{3} - \frac{5}{3} \left(\frac{1}{6}\right)^{N+1} - N \left(\frac{1}{6}\right)^{N+1}$$

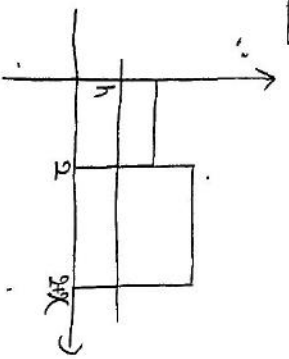
$$\lim_{N \rightarrow \infty} G_N = \frac{11}{3}$$

$$= \frac{11}{3} - \frac{5}{3} \left(\frac{1}{6}\right)^{N+1} + \left(\frac{1}{6}\right)^{N+1}$$

$$= \frac{11}{3} - \frac{1}{3} \left(\frac{1}{6}\right)^{N+1}$$

$$\lim_{N \rightarrow \infty} G_N = \frac{11}{3}$$

3

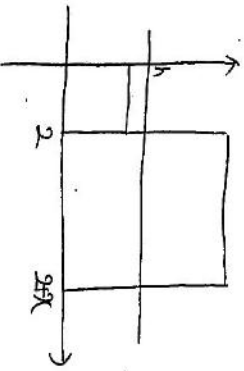


(1)

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

$$\Leftrightarrow h = \frac{4+x^2}{2(2+x)}$$

$$x=30 \text{ ㄱ } h = \frac{13}{10}$$



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

$$\Leftrightarrow \frac{x^2}{2} - 2 = xh$$

$$\Leftrightarrow h = \frac{x^2-4}{2x}$$

$$x=80 \text{ ㄱ }$$

$$h = \frac{64-4}{16} = \frac{15}{4}$$

$$h=30 \text{ ㄱ }$$

$$4+x^2=8+6x$$

$$\Leftrightarrow x^2-6x-4=0$$

$$\therefore x=3+\sqrt{13}$$

$$h \leq \frac{7}{8} \text{ ㄱ ㄱ }$$

$$\frac{4+x^2}{2(2+x)} \leq \frac{7}{8}$$

$$\Leftrightarrow 8x^2+32 \leq 2(4+x)$$

$$\Leftrightarrow 4x^2-7x+2 \leq 0$$

$$\Leftrightarrow \frac{1-\sqrt{17}}{8} \leq x \leq \frac{1+\sqrt{17}}{8}$$

(2)

$$(1) x=30 \text{ ㄱ }$$

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

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

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

$$h|_{x=3} = \frac{1}{2} \cdot \frac{9+12-4}{25} = \frac{17}{50}$$

$$(ii) 6 \leq x \leq 8 \text{ ㄱ ㄱ }$$

$$h = \frac{x^2-4}{2x}$$

$$V = \int_6^8 \pi h^2 dx$$

$$= \pi \int_6^8 \frac{(x^2-4)^2}{4x^2} dx$$

$$= \pi \int_6^8 \left(\frac{x^2}{4} - 2 + \frac{4}{x^2} \right) dx$$

$$= \pi \left[\frac{1}{12} x^3 - 2x - \frac{4}{x} \right]_6^8$$

$$= \frac{95}{6} \pi$$