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$$(i) \lim_{r \rightarrow 0} \frac{\sin(ar)}{r} = a$$

$$(ii) I(r) = -\frac{1}{r^2}(\cos r - 1)$$

$$(iii) \lim_{r \rightarrow +0} I(r) = \frac{1}{2}$$

$$(iv) V(r) = \frac{\pi}{2r^2} \left(1 - \frac{\sin 2r}{2r} \right)$$

$$(v) \lim_{r \rightarrow +0} V(r) = \frac{\pi}{3}$$

2

(i) $BC = t$

(ii) $x = -1$ で極小値 $\frac{-1}{\sqrt{3}}$ を取り, $x = 1$ で極大値 $\frac{1}{\sqrt{3}}$ を取る。

(iii) $\frac{d\theta}{dx} = \frac{1 - x^2}{(1 + x^2)\sqrt{1 + x^2 + x^4}}$

(iv) $I = \frac{\pi}{6}$

(v) $J = \frac{\pi}{4\sqrt{2}}$

3

$$(i) \overrightarrow{OH} = \vec{a} + \frac{1}{3}\vec{p} + \frac{5}{12}\vec{q}$$

$$(ii) AH : HM = 3 : 1$$

$$(iii) \vec{a} \cdot \vec{p} = -\frac{5}{4}t, \quad \vec{a} \cdot \vec{q} = -2t$$

$$(iv) \vec{p} \cdot \vec{q} = \frac{8}{5}$$

$$(v) V = \frac{2}{5}$$

4

$$(i) \quad a_1 = 0, \quad b_1 = \frac{1}{4}, \quad a_2 = \frac{3}{4}, \quad b_2 = 0$$

$$(ii) \quad a_{n+2} = b_{n+1} + \frac{1}{2}a_n, \quad b_{n+2} = \frac{1}{4}a_{n+1} + \frac{1}{2}b_n$$

$$(iii) \quad a_{n+4} = \frac{5}{4}a_{n+2} - \frac{1}{4}a_n.$$

$$(iv) \quad r = 1, \quad s = \frac{1}{4}$$

※ $r = \frac{1}{4}, s = 1$ でも良い.

$$(v) \quad a_n = \begin{cases} 0, & n = 2k + 1, \\ \frac{2}{3} + \frac{1}{3} \left(\frac{1}{4}\right)^k, & n = 2k. \end{cases}$$
$$b_n = \begin{cases} \frac{1}{3} - \frac{1}{12} \left(\frac{1}{4}\right)^k, & n = 2k + 1, \\ 0, & n = 2k. \end{cases}$$