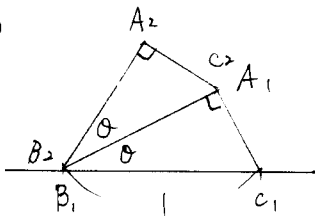


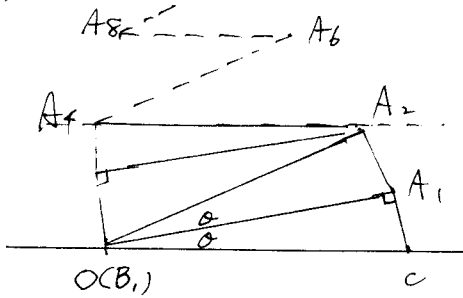
✕ (1)



$$A_1B_1 = B_1C_1 \cos \theta = \cos \theta, \quad A_2B_2 = A_1B_1 \cos \theta = \cos^2 \theta$$

$$\vec{A_2}(A_2B_2 \cos 2\theta, A_2B_2 \sin 2\theta) = \underline{\underline{(\cos^2 \theta \cdot \cos 2\theta, \cos^2 \theta \cdot \sin 2\theta)}}$$

(2)



$$OA_2 \parallel A_4A_6 \parallel \dots \parallel A_{4k}A_{4k+2} \parallel \dots$$

$$\vec{A_{4k}A_{4k+2}} = (\cos^4 \theta)^k \vec{OA_2}$$

$$OC_1 \parallel A_2A_4 \parallel A_6A_8 \parallel \dots \parallel A_{4k+2}A_{4k+4} \parallel \dots$$

$$\vec{A_{4k+2}A_{4k+4}} = (\cos^4 \theta)^k \vec{A_2A_4}$$

$$\therefore \vec{A_{4k}A_{4k+4}} = \vec{A_{4k}A_{4k+2}} + \vec{A_{4k+2}A_{4k+4}} = (\cos^4 \theta)^k \vec{OA_2} + (\cos^4 \theta)^k \vec{A_2A_4}$$

$$\therefore 2 \cdot \vec{OA_2} = (\cos^2 \theta \cos 2\theta, \cos^2 \theta \sin 2\theta) = \cos^2 \theta (\cos 2\theta, \sin 2\theta)$$

$$\vec{A_2A_4} = -(\cos^4 \theta, 0) \text{ 方向反転}$$

$$\vec{A_{4k}A_{4k+4}} = (\cos^4 \theta)^k (\cos^2 \theta \cos 2\theta - \cos^4 \theta, \cos^2 \theta \sin 2\theta)$$

$$= \cos^{4k+2} \theta (\cos^2 \theta - 1, \sin 2\theta)$$

$$\therefore \vec{OA_{4m}} = \vec{OA_4} + \vec{A_4A_8} + \dots + \vec{A_{4m-4}A_{4m}}$$

初項 $\cos^2 \theta (\cos 2\theta - 1, \sin 2\theta)$. 公比 $\cos^4 \theta$ の等比数列

$$\vec{OA_{4m}} = \sum_{k=0}^{m-1} \cos^{4k+2} \theta (\cos 2\theta - 1, \sin 2\theta)$$

$$= \frac{\cos^2 \theta (1 - \cos^{4m} \theta)}{1 - \cos^4 \theta} (\cos 2\theta - 1, \sin 2\theta)$$

$$\therefore x_m = \frac{\cos^2 \theta (1 - \cos^{4m} \theta)}{(1 - \cos^2 \theta)(1 + \cos^2 \theta)} \cdot (\cos 2\theta - 1) = \frac{\cos^2 \theta (\cos^{4m} \theta - 1)}{1 + \cos^2 \theta}$$

$$y_m = \frac{\cos^2 \theta (1 - \cos^{4m} \theta)}{(1 - \cos^2 \theta)(1 + \cos^2 \theta)} \cdot 2 \sin 2\theta \cos \theta = \frac{2(1 - \cos^{4m} \theta) \cdot \cos^3 \theta}{(1 + \cos^2 \theta) \sin \theta}$$

(3) $0 < \cos \theta < 1 \rightarrow 0 < \cos^4 \theta < 1 \Rightarrow m \rightarrow \infty$ とき $\cos^{4m} \theta \rightarrow 0$ となる

$$\lim_{m \rightarrow \infty} x_m = -\frac{\cos^2 \theta}{1 + \cos^2 \theta}$$

$$\lim_{m \rightarrow \infty} y_m = \frac{2 \cos^3 \theta}{(1 + \cos^2 \theta) \sin \theta}$$