

12/12 言語題3

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$$\begin{aligned} (1) f(t) &= (10 \cos t)^2 \\ &= 100 \cos^2 t \\ &= 100 \times \frac{1 + \cos 2t}{2} \\ &= 50 + 50 \cos 2t \\ T &= \frac{2\pi}{2} = \underline{\pi} \end{aligned}$$

$$(2) f(t) = \sin \frac{2\pi}{k} t \text{ (kは正の数)}$$

$$T = \frac{2\pi}{\frac{2\pi}{k}} = \underline{k}$$

$$\begin{aligned} (3) f(t) &= \sin t + \sin \frac{t}{2} + \sin \frac{t}{3} \\ &= \sin(t+T) + \sin \frac{t+T}{2} + \sin \frac{t+T}{3} \end{aligned}$$

$$\sin(2\pi m + t) = \sin t$$

$$T = 2\pi m, T = 2\pi n$$

$$\frac{T}{2} = 2\pi n, T = 4\pi n$$

$$\frac{T}{3} = 2\pi l, T = 6\pi l$$

$$2\pi m = 4\pi n = 6\pi l$$

$$\underline{T = 12\pi}$$

$$(4) f(t) = \sum_{k=1}^{\infty} b_k \sin kt$$

$$\underline{T = \frac{2\pi}{k}}$$

$$(5) f(t) = 2 \sin t \cos \frac{t}{2}$$

$$= \sin \frac{3}{2}t + \sin \frac{t}{2}$$

$$\frac{3}{2}T = 2\pi m, \frac{1}{2}T = 2\pi n$$

$$\frac{3}{2}T = 2\pi m, 4\pi n$$

$$\underline{T = 4\pi}$$

$$(6) f(t) = |\sin 3t|$$

$$T = \frac{\pi}{3} = \underline{\frac{\pi}{3}}$$

$$\begin{aligned} (7) f(t) &= \cos \omega_0 t \cdot \sin 5\omega_0 t \\ &= \frac{1}{2} \{ \sin 6\omega_0 t + \sin 4\omega_0 t \} \\ 6\omega_0 T &= 2\pi m, 4\omega_0 T = 2\pi n \end{aligned}$$

$$\frac{2\pi m}{6\omega_0} = \frac{2\pi n}{4\omega_0} \quad \underline{T = \pi}$$

$$\begin{aligned} (8) f(t) &= \sin^2 t \\ &= \frac{1 - \cos 2t}{2} \end{aligned}$$

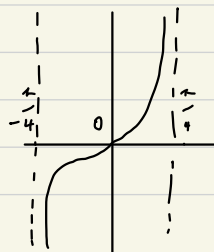
$$T = \frac{2\pi}{2} = \underline{\pi}$$

$$\begin{aligned} (9) f(t) &= \sin^3 t \\ &= \frac{3 \sin t - \sin 3t}{4} \end{aligned}$$

$$T = 2\pi m$$

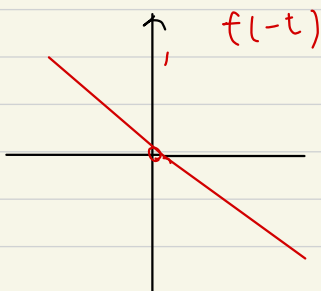
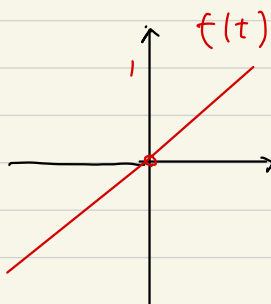
$$3T = 2\pi n \text{ where } \underline{T = 2\pi}$$

$$(10) f(t) = \tan 2t$$

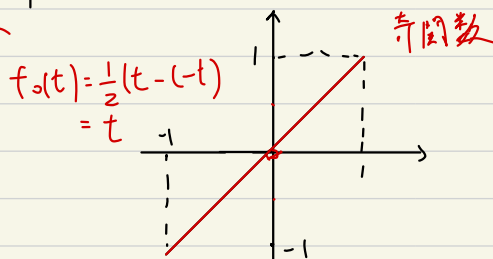
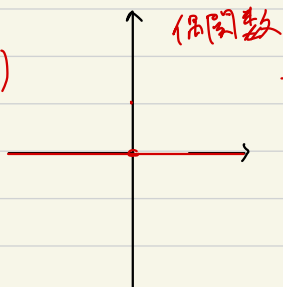


$$\underline{T = \frac{\pi}{2}}$$

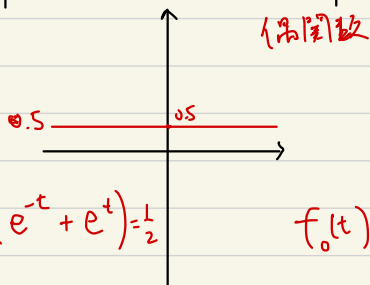
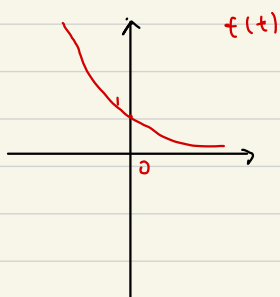
問2 (1)  $f(t) = (t, t \geq 0 \text{ and } 0, t < 0)$



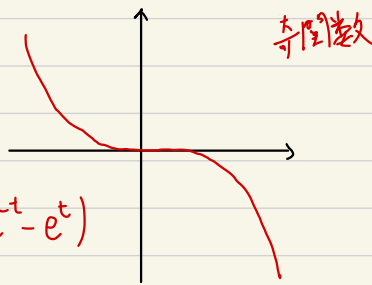
$$f_e(t) = \frac{1}{2}(t - t) = 0$$



(2)  $f(t) = (e^{-t}, t \geq 0 \text{ and } 0, t < 0)$



$$f_e(t) = \frac{1}{2}(e^{-t} + e^t) = \frac{1}{2}$$



$$f_o(t) = \frac{1}{2}(e^{-t} - e^t)$$

問3      11)  $x(t) = 1 + t + t^2 + t^3$

$$x(-t) = 1 - t + t^2 - t^3$$

偶関数  $f_e(t) = \frac{1}{2}(x(t) + x(-t))$

$$= \underline{1 + t^2}$$

奇関数  $f_o(t) = \frac{1}{2}(x(t) - x(-t))$

$$= \frac{1}{2}(1 + t + t^2 + t^3 - 1 + t - t^2 + t^3)$$

$$= \frac{1}{2}(2t + 2t^3)$$

$$= \underline{t + t^3}$$

(2)  $f(t) = \cos t + \sin t + \underbrace{2 \sin t \cos t}_{\sin 2t}$

$$\begin{aligned} f(-t) &= \cos t - \sin t - 2 \sin t \cos t \\ &= \cos t - \sin t - \sin 2t \end{aligned}$$

偶関数  $f_e(t) = \frac{1}{2}(f(t) + f(-t))$

$$= \frac{1}{2}(2 \cos t)$$

$$= \underline{\cos t}$$

奇関数  $f_o(t) = \frac{1}{2}(f(t) - f(-t))$

$$= \frac{1}{2}(2 \sin t + 2 \sin 2t)$$

$$= \sin t + \sin 2t$$

$$= \sin\left(\frac{3}{2}t + \frac{1}{2}t\right) + \sin\left(\frac{1}{2}t - \frac{1}{2}t\right)$$

$$= \underline{2 \sin \frac{3}{2}t \cos \frac{1}{2}t}$$