

横浜国立大学

経済（経済システム(経済コース), 経済システム(法と経済コース), 国際経済)

数学 - 解答

$$(1) \quad k = \int_0^1 f(t) dt \quad (k: \text{実数}) \text{ とおくと, } \quad f(x) = 6x^2 - k^2 \quad \dots\dots ①$$

ここで,

$$\begin{aligned} k &= \int_0^1 (6t^2 - k^2) dt \quad (① \text{より}) \\ &= [2t^3 - k^2 t]_0^1 \\ &= 2 - k^2 \end{aligned}$$

つまり,

$$k^2 + k - 2 = 0 \iff (k+2)(k-1) = 0$$

$$\therefore \underline{\underline{k = -2, 1}}$$

$$\therefore \underline{\underline{f(x) = 6x^2 - 4, f(x) = 6x^2 - 1}} \quad (\text{答})$$

$$(2) \quad l = \int_0^1 |g(t)| dt \quad (l: \text{正の実数}) \text{ とおくと, } \quad g(x) = 4x^2 - l^2 \quad \dots\dots ②$$

ここで,

$$l = \int_0^1 |4t^2 - l^2| dt$$

$$(i) \quad 1 \leq \frac{l}{2} \quad (2 \leq l) \text{ のとき}$$

$$\begin{aligned} l &= \int_0^1 (-4t^2 + l^2) dt \\ &= \left[-\frac{4}{3}t^3 + l^2 t \right]_0^1 \\ &= -\frac{4}{3} + l^2 \end{aligned}$$

$$\text{つまり, } l^2 - l - \frac{4}{3} = 0 \quad \therefore l = \frac{3 \pm \sqrt{57}}{6} \quad (l \geq 2 \text{ とならず不適})$$

$$(ii) \quad \frac{l}{2} \leq 1 \quad (0 < l \leq 2) \text{ のとき}$$

$$\begin{aligned} l &= \frac{l^3}{3} + \int_{\frac{l}{2}}^1 (4t^2 - l^2) dt \\ &= \frac{l^3}{3} + \left[\frac{4}{3}t^3 - l^2 t \right]_{\frac{l}{2}}^1 \\ &= \frac{l^3}{3} + \left(\frac{4}{3} - l^2 \right) - \left(\frac{l^3}{6} - \frac{l^3}{2} \right) \end{aligned}$$

つまり,

$$2l^3 - 3l^2 - 3l + 4 = 0$$

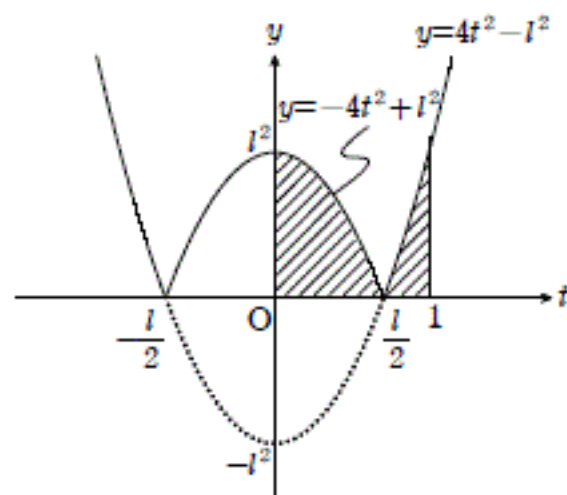
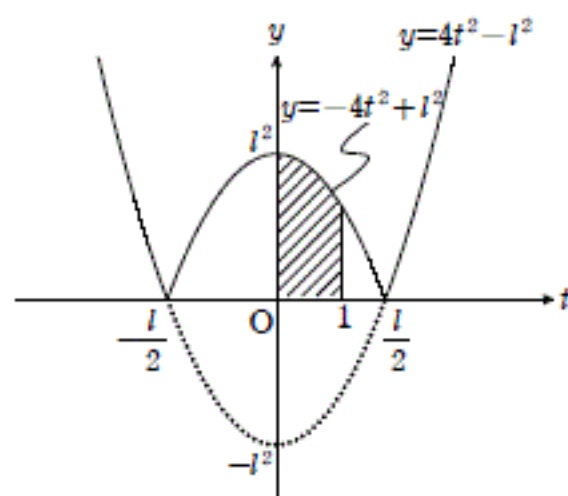
$$\iff (l-1)(2l^2 - l - 4) = 0 \quad \therefore l = 1, \frac{1 \pm \sqrt{33}}{4}$$

$$\text{ここで, } 0 < l \leq 2 \text{ より, } l = 1, \frac{1 + \sqrt{33}}{4}$$

$$\left(l^2 = 1, \frac{17 + \sqrt{33}}{8} \right)$$

以上(i), (ii)より,

$$\underline{\underline{g(x) = 4x^2 - 1, g(x) = 4x^2 - \frac{17 + \sqrt{33}}{8}}} \quad (\text{答})$$



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