

第 13 回数学の考え方解答

1 (1) $\frac{x^3}{3} - 2x^2 + 2x + C$

(2) $\frac{2}{3}t^3 + \frac{5}{2}t^2 - 3t + C$

(3) $-2x^3 - 2x + C$

(4) $\frac{2}{3}t^3 - \frac{1}{2}xt^2 - x^2t + C$

2 (1) $f(x) = x^3 - x^2 - 4$

(2) $f(x) = \frac{x^3}{3} - x + \frac{2}{3}$

3 (1) -31

(2) 9

(3) 30

(4) $\frac{16}{3}$

4 (1) i. $\frac{1}{3}(\beta - \alpha)^3$

ii. $-\frac{1}{6}(\beta - \alpha)^3$

(2) i. $-\frac{1}{6}$

ii. $-\frac{8\sqrt{2}}{3}$

5 (1) $\int_a^a x^{2n} dx = \frac{2a^{2n+1}}{2n+1} = 2 \int_0^a x^{2n} dx$ を示す。

(2)

6 (1) $f(x) = 6x^2 - x - 4$

(2) $f(x) = -12x - 6$

7 (1) $a = -1, 4$

(2) $x = -2$ で極大値 0, $x = 1$ で極小値 $-\frac{9}{2}$ をとる。

8 (1) $\frac{125}{6}$

(2) 2

9 (1) $\frac{32}{3}$

(2) $\frac{125}{24}$

10 (1) $l_1 : y = -4x + 3, l_2 : y = 8x - 33$

(2) 18

11 $a = a - {}^3\sqrt{4}$

12 $\frac{4}{3}$

13 $\frac{2-\sqrt{2}}{6}$

14 (a) $t \geq 0$ のとき、 $f(t) = \frac{1}{3} - \frac{t}{2}$

(b) $0 < t < 1$ のとき $f'(t) = 0$ とすると $t = \pm \frac{\sqrt{2}}{2}$

(c) $t \geq 1$ のとき $t = \frac{\sqrt{2}}{2}$ のとき最小値 $\frac{2-\sqrt{2}}{6}$

15 $(rhs) - (lhs) \geq 0$ を示す。

16 (1) 6

(2) $\frac{32}{3}$

17 (1) $\frac{37}{12}$

(2) $\frac{64}{3}$

18 (1) $a = 1, b = -1, c = -1$

(2) $\log \left| \frac{x+1}{x+2} \right| + \frac{1}{x+2} + C$

19 (1) $\frac{1}{4}$

(2) $\log 3$

(3) 6

(4) $\frac{3}{8}$

(5) $\frac{3}{2}$

(6) $\frac{124}{\log 5}$

(7) $e^2 - e^{-2} + 4$

(8) $\frac{1}{2} \log \frac{6}{5}$

20 (1) 10

(2) $-\frac{4}{3}$

(3) $\frac{434\sqrt{7}-26}{135}$

(4) $\frac{273}{10}$

(5) $\frac{4-\sqrt{2}}{12}$

(6) $\frac{15}{4}$

(7) 0

(8) $\frac{e+1}{2}$

(9) $\frac{2\sqrt{2}}{3}\pi + \frac{\sqrt{6}}{2}$

(10) $\frac{\pi}{6}$

(11) $\frac{\sqrt{3}}{12}\pi$

(12) $\frac{\pi}{32}$

21 $\log \frac{4}{3} - \frac{1}{6}$

22 (1) $1 - 3e^{-2}$

(2) $1 - 2e^{-1}$

(3) 1

(4) 0

23 (1) $f'(x) = x \sin x$

(2) $f'(x) = x \sin x - \cos x + 1$

24 $f(x) = -\cos x, F(x) = -\cos x + x + 1$

25 (1) $2\sqrt{2} - 2$

(2) $\frac{2}{\pi}$