

微積分学 I



1. 次の不定積分を求めよ.

$$(1) \int e^{-2x+1} dx$$

$$(2) \int \frac{4x}{\sqrt{1-x}} dx$$

$$(3) \int \frac{(\log x)^3}{x} dx$$

解答

$$\begin{aligned} 1 \quad (1) \quad & \int e^{-2x+1} dx \\ &= \int e^t \cdot \left(-\frac{1}{2}\right) dt \quad \left(t = -2x+1, \quad \frac{dx}{dt} = -\frac{1}{2} \right) \\ &= -\frac{1}{2} e^t + C = \underline{\underline{-\frac{1}{2} e^{-2x+1} + C}} \end{aligned}$$

$$\begin{aligned} (2) \quad & \int \frac{4x}{\sqrt{1-x}} dx \\ &= \int \frac{4(1-t)}{\sqrt{t}} (-1) dt \quad \left(1-x=t, \quad \frac{dx}{dt} = -1 \right) \\ &= -4 \int t^{-1/2} dt + 4 \int t^{1/2} dt \\ &= -4 \cdot 2 t^{1/2} + 4 \cdot \frac{2}{3} t^{3/2} + C = \underline{\underline{-8\sqrt{1-x} + \frac{8}{3}(1-x)^{3/2} + C}} \end{aligned}$$

$$\begin{aligned} (3) \quad & \int \frac{(\log x)^3}{x} dx \\ &= \int \frac{t^3}{x} \cdot x dt \quad \left(t = \log x, \quad \frac{dt}{dx} = \frac{1}{x} \right) \\ &= \int t^3 dt \\ &= \frac{1}{4} t^4 + C = \underline{\underline{\frac{1}{4} (\log x)^4 + C}} \end{aligned}$$