

## 部分積分の計算

**ここが重要**

$\int f(x) g'(x) dx$  から  $\int f'(x) g(x) dx$  が計算可能になるように変形する.

$$\left\{ \begin{array}{l} f(x) = \boxed{\hspace{2cm} (1) \hspace{2cm}} \\ g'(x) = \boxed{\hspace{2cm} (2) \hspace{2cm}} \end{array} \right. \quad \text{とおくと} \quad \left\{ \begin{array}{l} f'(x) = \boxed{\hspace{2cm} (3) \text{ 簡単な式} \hspace{2cm}} \\ g(x) = \boxed{\hspace{2cm} (4) \hspace{2cm}} \end{array} \right.$$

$$\begin{aligned} \int f(x) g'(x) dx &= \int \underbrace{f(x)}_{\parallel} \underbrace{g'(x)}_{\parallel} dx = \int f(x) g(x) dx - \int \underbrace{f'(x)}_{\parallel} g(x) dx \\ &= \int \boxed{(1)} \boxed{(4)} dx - \int \boxed{(3) \times (4)} dx \\ &= \boxed{\hspace{10cm}} \end{aligned}$$

部分積分の公式は複雑なので、公式を書いてから計算する

【例題 58】

(1)  $\int x \cos x dx$

$$\begin{cases} f(x) = \\ g'(x) = \end{cases} \quad \text{とおくと} \quad \begin{cases} f'(x) = \\ g(x) = \end{cases}$$

$$\begin{aligned} \int f(x) g'(x) dx &= \int \underbrace{f(x)}_{\parallel} \underbrace{g'(x)}_{\parallel} dx = \int \underbrace{f'(x)}_{\parallel} g(x) dx \\ &= \int \boxed{\phantom{x}} \boxed{\phantom{x}} dx - \int \boxed{\phantom{x}} dx \\ &= \boxed{\phantom{x}} \end{aligned}$$

(2)  $\int x e^x dx$

$$\begin{cases} f(x) = \\ g'(x) = \end{cases} \quad \text{とおくと} \quad \begin{cases} f'(x) = \\ g(x) = \end{cases}$$

$$\begin{aligned} \int f(x) g'(x) dx &= \int \underbrace{f(x)}_{\parallel} \underbrace{g'(x)}_{\parallel} dx = \int \underbrace{f'(x)}_{\parallel} g(x) dx \\ &= \int \boxed{\phantom{x}} \boxed{\phantom{x}} dx - \int \boxed{\phantom{x}} dx \\ &= \boxed{\phantom{x}} \end{aligned}$$

【例題 59】(1が かくれんぼ)

$$(1) \int \log x dx$$

$$\left\{ \begin{array}{l} f(x) = \square \\ g'(x) = \square \end{array} \right. \quad \text{とおくと} \quad \left\{ \begin{array}{l} f'(x) = \square \\ g(x) = \square \end{array} \right.$$

$$\begin{aligned} \int f(x) g'(x) dx &= \int \underbrace{f(x)}_{\parallel} \underbrace{g'(x)}_{\parallel} dx - \int \underbrace{f'(x)}_{\parallel} g(x) dx \\ &= \int \square \square dx - \int \square dx \\ &= \square \end{aligned}$$

【練習問題 49】(1が かくれんぼ)

$$\int \text{Tan}^{-1} x dx$$

$$\left\{ \begin{array}{l} f(x) = \square \\ g'(x) = \square \end{array} \right. \quad \text{とおくと} \quad \left\{ \begin{array}{l} f'(x) = \square \\ g(x) = \square \end{array} \right.$$

$$\begin{aligned} \int f(x) g'(x) dx &= \int \underbrace{f(x)}_{\parallel} \underbrace{g'(x)}_{\parallel} dx - \int \underbrace{f'(x)}_{\parallel} g(x) dx \\ &= \int \square \square dx - \int \square dx \\ &= \square \end{aligned}$$

部分分数分解

$$\frac{1}{(x+1)(x+2)} = \frac{\boxed{\phantom{000}}}{x+1} + \frac{\boxed{\phantom{000}}}{x+2}$$

$$\frac{x+4}{(2x+1)(x-3)} = \frac{\boxed{\phantom{000}}}{2x+1} + \frac{\boxed{\phantom{000}}}{x-3}$$

$$\frac{3x+2}{(x+3)(x-4)} = \frac{\boxed{\phantom{000}}}{x+3} + \frac{\boxed{\phantom{000}}}{x-4}$$

$$\frac{x}{(x+1)^2} = \frac{\boxed{\phantom{000}}}{x+1} + \frac{\boxed{\phantom{000}}}{(x+1)^2}$$

$$\frac{3x^3}{x^2-1} = \boxed{\phantom{000}} + \frac{\boxed{\phantom{000}}}{x+1} + \frac{\boxed{\phantom{000}}}{x-1}$$

有理化

$$\frac{1}{\sqrt{x+1} + \sqrt{x}} = \frac{1}{\sqrt{x+1} + \sqrt{x}} \times \boxed{\phantom{000}} = \boxed{\phantom{000}}$$

$$\frac{1}{\sqrt{x+1} - \sqrt{x+3}} = \frac{1}{\sqrt{x+1} - \sqrt{x+3}} \times \boxed{\phantom{000}} = \boxed{\phantom{000}}$$