

$$\begin{aligned} \textcircled{1} \quad & \int (x+2) dx \\ &= \boxed{\int x dx} + \int 2 dx \\ &= \frac{x^2}{2} + 2 \int 1 dx \\ &= \frac{x^2}{2} + 2x + C \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad & \int (3x^2 + 4x) dx \\ &= 3 \int x^2 dx + 4 \int x dx \\ &= x^3 + 2x^2 + C \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad & \int (x+1)^6 dx \\ & \quad \left(\begin{array}{l} f(ax+b) \\ \text{form} \end{array} \right) \\ &= \frac{1}{7} (x+1)^7 + C \quad (\int x^6 dx = \frac{1}{7} x^7 + C) \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad & \int (x-1)^3 - (2x-1)^3 dx \\ &= \int (x-1)^3 dx - \int (2x-1)^3 dx \quad g(x) := x^3 \\ & \quad \int g(u) du = \frac{u^4}{4} + C \\ &= \frac{1}{4}(x-1)^4 - \frac{1}{4}(2x-1)^4 \left(\frac{1}{4}\right) + C \\ &= \frac{1}{4}(x-1)^4 - \frac{1}{32}(2x-1)^4 + C \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad & \int e^{4x+3} dx \\ & \quad f(ax+b), f(x) = e^x \\ &= \frac{1}{4} e^{4x+3} + C \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad & \int (4x e^{-\frac{x}{2}+1}) dx \\ & \quad \text{Made with Goode} \\ &= f(x) + \int e^{\frac{ax+b}{2}} dx \\ &= 4x - 2e^{\frac{-x}{2}+1} + C \end{aligned}$$

$$\textcircled{7} \int \frac{1}{3x+2} dx \quad \int \frac{1}{x} dx = \ln|x| + C$$

$$= \frac{1}{3} \ln|3x+2| + C$$

$$\textcircled{8} \int \frac{x^3-1}{(x-1)^3} dx \quad \left[\begin{array}{l} \int \frac{x^2+2x+1}{x} dx \\ = \int (3x+2+\frac{1}{x}) dx \end{array} \right]$$

$$= \int \frac{(x-1)(x^2+x+1)}{(x-1)^3} dx$$

$$= \int \frac{x^2+x+1}{x-1} dx$$

$$= \int \left(\frac{x^2-x}{x-1} + \frac{2x-2}{x-1} + \frac{3}{x-1} \right) dx$$

$$= \int \left(x+2 + \frac{3}{x-1} \right) dx$$

$$= \frac{x^2}{2} + 2x + 3 \ln|x-1| + C$$

$$\textcircled{9} \int \frac{x^2+3x+2}{x+1} dx \quad \rightarrow (x+1)(x+2)$$

$$= \int \left(\frac{x^2+x}{x+1} + \frac{2x+2}{x+1} \right) dx$$

$$= \int (x+2) dx = \frac{x^2}{2} + 2x + C$$

$$\textcircled{10} \int \frac{1}{x^2-5x+6} dx \quad \begin{array}{l} \rightarrow \frac{1}{(x-2)(x-3)} \\ \rightarrow (x-\frac{5}{2})^2 - \frac{1}{4} \end{array}$$

$$= \int \frac{1}{(x-2)(x-3)} dx$$

$$= \int \left(\frac{-1}{x-2} + \frac{1}{x-3} \right) dx$$

$$= -\ln|x-2| + \ln|x-3| + C$$

$$= \ln \left| \frac{x-3}{x-2} \right| + C$$

$$= \ln \left| 1 - \frac{1}{x-2} \right| + C$$