02-01

$(1) \int x \sin 2x dx$

$$
\begin{aligned}
&= \int x \left\{ -\frac{1}{2} \cos 2x \right\}' dx \\
&= -\frac{1}{2} x \cos 2x - \int -\frac{1}{2} \cos 2x dx \\
&= -\frac{1}{2} x \cos 2x - \frac{1}{4} \sin 2x + C
\end{aligned}
$$

$(2) \int x \cos 3x dx$

$$
\begin{aligned}
&= \int x \frac{1}{3} \{\sin 3x\}' dx \\
&= \frac{1}{3} x \sin 3x - \int \frac{1}{3} \sin 3x dx \\
&= \frac{1}{3} x \sin 3x + \frac{1}{9} \cos 3x + C
\end{aligned}
$$

$(3) \int \frac{x}{\cos^2 x} dx$

$$
\begin{aligned}
&= \int x \{\tan x\}' dx \\
&= x \tan x - \int \tan x dx \\
&= x \tan x - \int \frac{\sin x}{\cos x} dx \\
&= x \tan x - \int \frac{-\{\cos x\}'}{\cos x} dx \\
&= x \tan x - (-\log |\cos x|) + C \\
&= x \tan x + \log |\cos x| + C
\end{aligned}
$$

$(4) \int x \log(x-2) dx$

$$
\begin{aligned}
&= \int \frac{1}{2} (x^2 - 2^2)' \log(x-2) \\
&= \frac{1}{2} (x^2 - 2^2) \log(x-2) - \int \frac{1}{2} (x^2 - 2^2) \frac{1}{x-2} dx \\
&= \frac{1}{2} (x^2 - 2^2) \log(x-2) - \int \frac{1}{2} \frac{(x+2)(x-2)}{x-2} dx \\
&= \frac{1}{2} (x^2 - 2^2) \log(x-2) - \int \frac{1}{2} (x+2) dx \\
&= \frac{1}{2} (x^2 - 2^2) \log(x-2) - (\frac{1}{4} x^2 + x) + C
\end{aligned}
$$

$(5) \int x^3 \log x dx$

$$
\begin{aligned}
&= \int \frac{1}{4}(x^4)' \log x dx \\
&= \frac{1}{4}x^4 \log x - \int \frac{1}{4}x^4 \frac{1}{x} dx \\
&= \frac{1}{4}x^4 \log x - \int \frac{1}{4}x^3 dx \\
&= \frac{1}{4}x^4 \log x - \frac{1}{16}x^4 + C
\end{aligned}
$$

$(6) \int (2x-1)e^x dx$

$$
\begin{aligned}
&= \int (2x-1)(e^x)' dx \\
&= (2x-1)e^x - \int 2e^x dx \\
&= (2x-1)e^x - 2e^x + C \\
&= (2x-3)e^x + C
\end{aligned}
$$

$(7) \int x e^{-3x} dx$

$$
\begin{aligned}
&= \int -\frac{1}{3}x(e^{-3x})' dx \\
&= -\frac{1}{3}xe^{-3x} - \int -\frac{1}{3}e^{-3x} dx \\
&= -\frac{1}{3}xe^{-3x} - \frac{1}{9}e^{-3x} + C \\
&= e^{-3x}(-\frac{1}{3}x - \frac{1}{9}) + C
\end{aligned}
$$

$(8) \int \log(x+2) dx$

$$
\begin{aligned}
&= \int (x+2)' \log(x+2) dx \\
&= (x+2)\log(x+2) - \int (x+2)\frac{1}{x+2} dx \\
&= (x+2)\log(x+2) - \int 1 dx \\
&= (x+2)\log(x+2) - x + C
\end{aligned}
$$

$(9) \int \log(1-x)dx$

$$
\begin{aligned}
&= \int (x-1)' \log(1-x)dx \\
&= (x-1)\log(1-x) - \int (x-1)\frac{1}{1-x}dx \\
&= (x-1)\log(1-x) - \int -1dx \\
&= (x-1)\log(1-x) + x + C
\end{aligned}
$$

02-02

$(1) \int x\cos 2xdx$

$$
\begin{aligned}
&= \int \frac{1}{2}x(\sin 2x)'dx \\
&= \frac{1}{2}x\sin 2x - \int \frac{1}{2}\sin 2xdx \\
&= \frac{1}{2}x\sin 2x + \frac{1}{4}\cos 2x + C
\end{aligned}
$$

$(2) \int x\sin 3xdx$

$$
\begin{aligned}
&= \int -\frac{1}{3}x(\cos 3x)'dx \\
&= -\frac{1}{3}x\cos 3x - \int -\frac{1}{3}\cos 3xdx \\
&= -\frac{1}{3}x\cos 3x + \frac{1}{9}\cos 3x + C \\
&= \cos 3x(-\frac{1}{3}x + \frac{1}{9}) + C
\end{aligned}
$$

$(3) \int \frac{2x}{\cos^2 x}dx$

$$
\begin{aligned}
&= \int 2x(\tan x)'dx \\
&= 2x\tan x - \int 2\tan xdx \\
&= 2x\tan x + 2\log|\cos x| + C
\end{aligned}
$$

02-03

$(1) \int xe^x dx$

$$
\begin{aligned}
&= \int x(e^x)' dx \\
&= xe^x - \int e^x dx \\
&= xe^x - e^x + C \\
&= e^x(x-1) + C
\end{aligned}
$$

$(2) \int xe^{-2x} dx$

$$
\begin{aligned}
&= \int -\frac{1}{2} x(e^{-2x})' dx \\
&= -\frac{1}{2} xe^{-2x} - \int -\frac{1}{2} e^{-2x} dx \\
&= -\frac{1}{2} xe^{-2x} - \frac{1}{4} e^{-2x} + C \\
&= e^{-2x}(-\frac{1}{2}x - \frac{1}{4}) + C
\end{aligned}
$$

$(3) \int (2x-1)e^{2x} dx$

$$
\begin{aligned}
&= \int \frac{1}{2}(2x-1)(e^{2x})' dx \\
&= \frac{1}{2}(2x-1)e^{2x} - \int e^{2x} dx \\
&= \frac{1}{2}(2x-1)e^{2x} - 2e^{2x} + C \\
&= e^{2x}(x - \frac{5}{2}) + C
\end{aligned}
$$

$(4) \int x^2 \log x dx$

$$
\begin{aligned}
&= \int \frac{1}{3}(x^3)' \log x dx \\
&= \frac{1}{3} x^3 \log x - \int \frac{1}{3} x^3 \frac{1}{x} dx \\
&= \frac{1}{3} x^3 \log x - \frac{1}{9} x^3 + C
\end{aligned}
$$

(5) $\int (x-1)^3 \log(x-1) dx$

$$
\begin{aligned}
&= \int \frac{1}{4}\{(x-1)^4\}' \log(x-1) dx \\
&= \frac{1}{4}(x-1)^4 \log(x-1) - \int \frac{1}{4}(x-1)^4 \frac{1}{x-1} dx \\
&= \frac{1}{4}(x-1)^4 \log(x-1) - \frac{1}{16}(x-1)^4 + C
\end{aligned}
$$

(6) $\int \log 2x dx$

$$
\begin{aligned}
&= \int \frac{1}{2}(2x)' \log 2x dx \\
&= x \log 2x - \int \frac{1}{2} 2x \frac{1}{2x} dx \\
&= x \log 2x - \frac{1}{2}x + C
\end{aligned}
$$

(7) $\int \log(3-x) dx$

$$
\begin{aligned}
&= \int (x-3)' \log(3-x) dx \\
&= (x-3) \log(3-x) - \int (x-3) \frac{1}{3-x} dx \\
&=
\end{aligned}
$$

02-04

(1) $\int x^2 \sin x dx$

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