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① $3te^{2t}$

let $u = 3t$

$du/dt = 3$

let $v = e^{2t}$

$dv/dt = e^{2t}/2$

$$\int 3te^{2t} dt = \frac{3t(e^{2t})}{2} - \int \frac{e^{2t}}{2} \cdot 3 dt$$

$$\int 3te^{2t} dt = \frac{3te^{2t}}{2} - \frac{3e^{2t}}{4} + C$$

② $x^2 \sin x$

$u = x^2$

$du/dx = 2x$

let $v = \sin x$

$dv/dx = -\cos x$

$$= -x^2 \cos x + \int \cos x \cdot 2x dx$$

let $u = 2x$

$du/dx = 2$

let $v = \cos x$

$v = \sin x$

$$= x^2 \cos x + 2x \sin x - \int \sin x \cdot 2 dx$$

$$= x^2 \cos x + 2x \sin x - \int 2 \sin x dx$$

$$= x^2 \cos x + 2x \sin x + 2 \cos x$$

$$\int x^2 \sin x dx = 2x \cos x + 2 \cos x - x^2 \cos x$$

$$\textcircled{3} \sin 7x \cos 2x$$

$$A = 7x \quad B = 2x$$

$$\sin A \cos B = \frac{1}{2} [\sin(A+B) + \sin(A-B)]$$

$$= \frac{1}{2} [\sin 9x + \sin 5x]$$

$$\int \sin 7x \cos 2x dx = \frac{1}{2} \int (\sin 9x + \sin 5x) dx$$

$$= \frac{1}{2} \left(-\frac{\cos 9x}{9} - \frac{\cos 5x}{5} \right)$$

$$= -\frac{1}{2} \left(\frac{\cos 9x}{9} + \frac{\cos 5x}{5} \right) + C$$

$$\textcircled{4} \frac{2x - 3x^2}{1-x}$$

$$\begin{array}{r} 3x - 1 \\ \hline 1-x \quad 2x - 3x^2 \\ - 3x - 3x^2 \\ \hline -x \end{array}$$

$$\frac{1-x}{1}$$

$$\Rightarrow \int (3x - 1) dx + \int \frac{1}{1-x}$$

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