(5) $\int \underset{u}{\underset{v'}{x^{10}}} \underset{v'}{\underset{u}{e^x}}\,dx \longrightarrow \int x^{10}e^x dx = x^{10}e^x - \boxed{\int 10x^{\boxed{9}}e^x dx}$ ✓

$\rightsquigarrow \int x^{10}e^x dx = \frac{e^x x^{11}}{11} - \boxed{\int \frac{e^x x^{\boxed{11}}}{11} dx}$

$$\int x^{10}e^x dx = x^{10}e^x - 10\boxed{\int x^9 e^x dx}$$

$$= \cdots - k\boxed{\int x^8 e^x dx}$$

$\vdots$

$$\int \underset{u}{x}\,\underset{v'}{e^x} dx = xe^x - \int e^x dx$$
$$= xe^x - e^x + c$$

Define $I_n = \int x^n e^x dx$

$$\Rightarrow \boxed{I_n} = x^n e^x - \int n x^{n-1} e^x dx$$
$$= x^n e^x - n\boxed{I_{n-1}} \rightarrow \text{"reduction formulae"}$$

"recurrence relation"

$$\boxed{I_0 = e^x + c}$$

## Reduction formulae.

Define $\boxed{I_n} = \int \cdots dx,\ n \in \mathbb{Z}^+$.

Relate $I_n$ & $\{I_{n-1}, I_{n-2}, \ldots, I_1\}$

eg. $I_n = \boxed{I_{n-1} + 3I_{n-2}}$ → "reduction"

$\int e^{3x}(x^3)dx \rightarrow \underline{I_n} = \int e^{3x}(x^n)dx$

$\underline{I_n} = \int e^{nx}(x^3)dx$

$\underline{I_n} = \int e^{nx}(x^n)dx.$

which is easier to express in $\boxed{I_{n-1}}$?

decide based on context.