

INTEGRATION BY PARTS.

EX $\int 2x^5 e^{-2x} dx$
 PART REDUCING TO 0

$$= +2x^5 \left(-\frac{1}{2}e^{-2x}\right) - 10x^4 \left(\frac{1}{2}e^{-2x}\right) + 40x^3 \left(-\frac{1}{8}e^{-2x}\right) - 120x^2 \left(\frac{1}{16}e^{-2x}\right) + 240x \left(-\frac{1}{32}e^{-2x}\right) - 240 \left(\frac{1}{64}e^{-2x}\right)$$

① $\begin{matrix} \text{PART} \\ u \end{matrix} \quad \begin{matrix} \text{OTHER PART,} \\ dv \end{matrix}$

② TAKE DERIVATIVES
↓

$$\begin{array}{r} 2x^5 + e^{-2x} \\ 10x^4 - \frac{1}{2}e^{-2x} \\ 40x^3 + \frac{1}{4}e^{-2x} \\ 120x^2 - \frac{1}{8}e^{-2x} \\ 240x + \frac{1}{16}e^{-2x} \\ 240 - \frac{1}{32}e^{-2x} \\ 0 + \frac{1}{64}e^{-2x} \end{array}$$

INTEGRATE ②
↓
④

DIAGONALS, ~~4~~
PLUS, MINUS, ...

STARTER
↳

EX $\int_0^{\infty} 2x^3 e^{-2x} dx = 2x^3 \left(-\frac{1}{2}e^{-2x}\right) \Big|_0^{\infty} - 6x^2 \left(\frac{1}{4}e^{-2x}\right) \Big|_0^{\infty}$

① PART REDUCING TO 0, TAKE DERIVATIVES
② OTHER PART, INTEGRATE

$$+ 12x \left(-\frac{1}{8}e^{-2x}\right) \Big|_0^{\infty} - 12 \left(\frac{1}{16}e^{-2x}\right) \Big|_0^{\infty}$$

① $\begin{matrix} u \\ 2x^3 \\ 6x^2 \\ 12x \\ 12 \\ 0 \end{matrix} \quad \begin{matrix} dv \\ e^{-2x} \\ -\frac{1}{2}e^{-2x} \\ +\frac{1}{4}e^{-2x} \\ -\frac{1}{8}e^{-2x} \\ +\frac{1}{16}e^{-2x} \end{matrix}$

$$= \frac{12}{16}$$

↑
ENDS AT ZERO

DIAGONALS,
~~2~~ PLUS, MINUS, ...

③