Calculus II

Integrals of the form $\int e^{ax} \mathbf{d}x$

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Example (Substitution Rule)

Find $\int e^{3x}\mathrm{d}x.$

$$\begin{aligned} \text{Let} \quad u &= 3x. \\ \text{Then} \quad \mathrm{d}u &= 3\mathrm{d}x \\ \mathrm{d}x &= \frac{1}{3}\mathrm{d}u. \end{aligned}$$

$$\begin{aligned} \text{Substitute:} \quad \int e^{3x}\mathrm{d}x &= \int \frac{1}{3}e^{u}\,\mathrm{d}u \\ &= \frac{1}{3}e^{u} + C \\ &= \frac{1}{3}e^{3x} + C. \end{aligned}$$